THE RELATIONSHIP BETWEEN BELOW-TARGET RETURNS AND INTERPERIOD ASSET RETURN VARIABILITY IN THE COMMERCIAL BANKING INDUSTRY: AN EMPIRICAL STUDY

By

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DEDICATION

This dissertation is lovingly dedicated to my family without whose concern and support it would have never reached fruition. It is dedicated to my husband without whose insight and foresight I would have never begun the journey. It is dedicated to my son, Derrick Johnson, whose daily assistance began during my master's degree studies and continued through the preparation of the manuscript herein. It is dedicated to my husband's parents, Russell and Barbara Johnson, whose help made it possible for me to complete my bachelor's degree studies. And, finally, it is dedicated to my parents, Charles and Wilma Kelly, whose moral support helped make the dream a reality.

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An alternative theory to uniform risk aversion in decision-making is Fishburn's mean-risk framework. When comparing two risky alternatives, the alternative (A) with higher variance may dominate the other (B) because A increases the likelihood of achieving the "target" outcome. It has been shown in laboratory experiments conducted by Kahneman and Tversky and by Payne, Laughhunn, and Crum that when decision makers are faced with risky alternatives that represent economic gains relative to a target, they consistently choose the alternatives characterized by lower variances. However, when the same decision makers are faced with risky alternatives which represent economic losses

relative to a target, they consistently choose the alternatives characterized by higher variances. These choices suggest that decision makers become risk seeking (in the traditional variance sense) when faced with the prospect of losses and when the alternatives with the larger variances offer a possibility of breaking even or realizing a gain. Further, Payne, Laughhunn, and Crum manipulated the target so that it became nonzero and positive by explicit instruction in the laboratory setting. Risk seeking behavior was again exhibited when decision makers were faced with risky alternatives representing economic gains, but below-target outcomes.

This study examines ex-post facto the variability of asset and equity returns of approximately 14,000 commercial banks per year for the period 1979 through 1985. Those groups of banks in greater jeopardy of not achieving target rates of return as of mid-year are compared to those groups in less jeopardy. The findings consistently support the theory that the former groups accept or seek greater variance of return than the latter groups. In other words, the tolerance for risk (in the variance sense) is, indeed, a function of both the results of past decisions and the relationship between these results and target outcomes.

Industry deregulation has confronted bankers with the need to make a variety of decisions previously made for them

through the regulation of loan and deposit interest rates. The insights provided by the results of this study enable the regulators and the managers of banking organizations to better anticipate patterns of risky choice behavior.

CHAPTER 1

INTRODUCTION

1.1 Overview

The environment in which the banking industry of the United States operates is currently being transformed from one which is significantly influenced by government regulation to one that is much more influenced by competitive market forces. This transition is considered by some to be long overdue and, at the other extreme, much too rapid by others. What is almost unanimously agreed upon is that bank managers are now being confronted with the need to make radically different decisions. Indeed, some recent developments in the banking industry, particularly with respect to risky investments, suggest behavior which is not consistent with traditional assumptions of risk averse behavior.

The banking environment provides a laboratory to test the validity of an alternate theory of risk assessment and choice behavior. This theory states that perceived risk is a function of the likelihood of not achieving a specific goal or target. Major contributors to the development of this theory are Kahneman and Tversky [13], Fishburn [6], and Crum, Laughhunn, and Payne [16,22,23].

Prospect theory describes individuals as averse to risk as long as all possible outcomes are more favorable than a specified goal or target. That is, above the target, utility functions are concave, increasing at a decreasing rate in expected wealth. This alternative theory, however, allows utility functions to be convex below the target. That is, an individual may exhibit both risk averse and risk loving behavior as a function of the relationship between outcomes and the target.

The researchers mentioned above have tested this phenomenon in laboratory settings and found strong supporting evidence. McGlothlin [18] also noted similar behavior on the part of race track bettors. Betting patterns in the last race of the day included more bets on "long shots" and suggested less risk averse or more risk seeking behavior. Further, the amount wagered on any race was positively associated with the number of losing bettors in the previous race. The bettors became more risk seeking, apparently so that they could at least breakeven. Implicit in this observation is, again, the existence of a target outcome (zero losses).

In addition, it appears that decisions with respect to each race were not made in isolation. Tversky and Kahneman [30] suggest that decisions are made within the framework of a "psychological account." This psychological account includes not only a target or reference point considered to be neutral or normal, but can also include outcomes of past decisions. The race track bettors seemed to include the losses attributable to earlier races in their psychological accounts when making decisions about later races. More risk seeking behavior was exhibited in an attempt to achieve outcomes which would allow them to reach their target of zero losses.

The behavior of the race track bettors may be representative of risky choice behavior in general. If prospect theory could successfully explain the behavior of bank managers, there would be two significant results. First, prospect theory would be further validated. Secondly, the relevant factors in the decision making process of commercial bankers would be more fully appreciated.

This study extends the empirical testing of the theory by examining actual investment decisions of bank managers. The motivating question of this study is "Do bank managers increase the risk exposure of their investors when it appears that the perceived target will not be reached?" If the answer to this question if "Yes," all interested parties will be better able to assess the impact of deregulation and of the more competitive environment which exists today.

1.2 Background and Environment

Kaufman, Mote, and Rosenblum [14] have observed:

> The current organizational and regulatory structure of the financial services industry, broadly defined, is one of the major remaining legacies of the banking collapse and depression of the 1930's. The diagnosis at the time was that the bank failures had resulted in large measure from excessive competition in combination with managerial errors and abuses. Thus, the Banking Acts of 1933 and 1935 introduced a large array of

> restrictions on banking designed to shelter banks both from excessive competition and from errors and poor judgment of their own managements. With the advantage of hindsight and the results of a number of studies of the causes of the depression and the banking crisis completed over subsequent decades, one can conclude with some confidence that the diagnosis and cures adopted in the 1930's were, for the most part, incorrect and inappropriate [14,pp. 789-790].

Geographical, structural, and pricing restrictions of banking activities have existed simultaneously with rising and volatile interest rates, increasing competition from within and outside of the banking industry, major technological changes, and redefinitions of international transactions. Because of these factors, banks today operate in a much riskier environment than that which existed in the 1960s and early 1970s. This is true even in spite of the Banking Act of 1933 (Glass-Steagall) to ensure safety and soundness of operations and creation of the Federal Deposit Insurance Corporation to insure certain deposits [29].

In the 1970s the general level of interest rates rose dramatically. Regulation Q of the Federal Reserve placed limits on the rates of interest that could be paid to savers with relatively small amounts of money to invest. Money market funds offered market rates of interest to these small savers and, as a result, grew rapidly. The shift of such funds from commercial banks (and other depository institutions) to money market funds (with total assets on the order of $200 billion by 1980) represented a significant loss of low-cost resources. Other nonbank firms or financial conglomerates have begun to offer transactions accounts, once offered only by depository institutions. In the 1970s mutual savings banks introduced negotiable orders of withdrawal - N.O.W. accounts--which are effectively interest-bearing transactions accounts. Commercial banks were not universally permitted to offer these accounts until 1981. In the interim, these accounts also threatened the availability of low cost funds.

The success of commercial bank competitors has been enhanced by the advent of the "electronic age." State borders, or even national boundries, have no meaning when money can be transferred in a matter of seconds [5]. Commercial banks have been forced by competition to adopt such technology (to a greater or lesser extent), but they have not been given the unqualified right to use it without geographical restriction [19].

This is not to suggest that commercial banks have been completely unable to expand beyond the borders of states in which they are chartered. Individual states have begun to enact legislation allowing regional (multistate) operation [3]. Geographical (as well as functional) expansion is also possible through the federally regulated bank holding company structure [14]. Therefore, commercial banks have at least partially been able to meet the challenge of competition on a broader geographic scale.

Perhaps the most significant development with respect to the competitive position of commercial banks is the deregulation of deposit rates of interest. This, together with the virtual elimination of most usury ceilings on loan interest rates, has given banks the flexibility to operate more freely and compete successfully. (The deregulation was accomplished primarily through the enactment of The Depository Institutions Deregulation and Monetary Control Act of 1980 and the Garn-St. Germain Depository Institutions Act of 1982 [4].)

Yet, despite an improved competitive position, all is not necessarily well. There is reason to be concerned with the safety and soundness of banks in this era of deregulation. Shome, Smith, and Heggestad [27] studied 99 large, publicly held, commercial bank holding companies over the period 1974 through 1983. The results of their study indicate that market prices of these firms' common equity are positively correlated with the firms' equity ratios. In other words, investors in these bank holding companies were willing to pay higher stock prices for higher capital levels during the period examined. In general, this suggests that financial markets may consider capital levels of some commercial banks to be inadequate.

Further, the rate of bank failures is now five times the failure rate from 1941 through 1980 [21]. An increase in the prevalence of brokered deposits appears to have contributed to and resulted from the higher failure rate. Brokered deposits are offered to commercial banks by third parties or brokers who divide deposits in excess of $100,000 into $100,000 segments and place these segments into accounts at different commercial banks. In this manner the full benefit of federal deposit insurance is obtained for each dollar so deposited.

A brokered transaction confers benefits on each of the three parties. The depositor receives market rates of interest and deposit insurance. The broker receives a fee. The commercial bank enjoys an infusion of funds. Commercial banks are now able to offer deposit rates of interest on large denomination certificates of deposit which compete successfully with other money market instruments and have the added advantage of federal deposit insurance for cerificates up to $100,000. Thus by raising its certificate of deposit rates to attract brokered deposits, the bank can dramatically increase its funding base.

This facility to increase funding dramatically is also the source of a serious problem with brokered funds. If the bank invests the high-cost funds in assets with rates of return more than high enough to offset the deposit rates, the investment must be riskier than normally might be the case. This situation may be exacerbated if the broker "suggests" an investment opportunity that is even more risky or is one with which the bank may be unfamiliar [10]. Therefore, the bank may become less safe as a result of the brokered deposit. According to William Isaac, former Chairman of the Federal Deposit Insurance Corporation (FDIC), since 1982, 46 of 90 failed commercial banks have held substantial brokered deposits at the time of failure [12].

Volatile, high-cost (sometimes brokered) deposits clearly present a challenge to sound investment policy for commercial banks. Another indication that the risk characteristics of bank portfolios may be changing is the existence of large portfolios in troubled international loans. During the 1970s oil exporting countries experienced large trade surpluses and sought to invest at least part of these surpluses in western banks. Simultaneously, oil-importing countries, many of which were developing countries, sought loans to cover what were anticipated to be temporary balance of payments deficits caused by more expensive oil imports. Large premiums were associated with many of these loans. Some were guaranteed by the respective foreign governments; others were made directly to the government itself. Currently, the repayment of many such loans is questionable. Further, a total write-off of the loans would place several money center banks in jeopardy of insolvency.

For example, Citicorp made loans to less developed countries (LDC's) at rates 2.5 percentage points above those on U.S. loans. In 1977, 82% of Citicorp earnings was earned abroad. In 1984, 62% of Citicorp earnings was attributable to overseas operations. However, the bank's loan portfolio attributable to six troubled LDCs amounted to $12.3 billion. This represented 213% of the shareholders' equity [2]. If all such loans had to be written off, the bank would have been declared insolvent. In 1987, a loan loss reserve of $2 billion was established in connection with these loans. As with brokered deposits, the resulting perception is that more risk has been incorporated into the banking system because of these problem international loans.

No discussion of the riskiness of bank portfolios would be complete without considering deposit insurance. Campbell and Glenn [4] suggest that

> the insolvency mechanism applicable to government insured institutions is quite different from the one which applies to most other firms. In fact, the creation of the government deposit insurance system in 1933 may be viewed as a substitution of a new legal procedure for determining insolvency for the one then prevailing. . . . Under present statutes, insolvency is determined essentially on the basis of measures of the book value or net worth of insured institutions. Moreover, substantial latitude regarding the appropriate measure of net worth is granted the regulatory authorities [4,pp. 776-777].

Commercial banks undoubtedly realize that even if risky investment decisions do not provide the desired results, the bank will likely not be insolvent until the Comptroller of the Currency or the applicable state authority says it is insolvent. Since the resources of FDIC are not limitless, authorities may hesitate to declare a bank insolvent for fear of exhausting these resources. It is even possible that a troubled bank will exploit the FDIC. According to Pyle [24],

> A bank in trouble can go to the brokered deposit market instead of the discount window for liquidity. This is quite rational behavior when the insurers offer failing institutions a bargain insurance rate on brokered deposits while the Federal Reserve wants good collateral for loans at the discount window [24,p.7].

This suggests that a bank in an unsound financial position may actually seek a risky brokered solution (and perhaps the attendant riskier investment) with a certain amount of confidence that the likelihood of "ruin" is small.

Paul Volcker [31] has observed that

> . . . [in] the decades that have passed since any serious weaknesses in the financial system had been evident, a sense of security among depositors rooted in part in the knowledge of a strong governmental "safety-net" protecting the financial system, and expectations of a persistent inflationary trend have all seemed to encourage less caution and a willingness--deliberately or not--for managers of financial institutions to undertake greater leverage and risk in the search of higher returns [31,p.55].

The above discussion indicates that the risk characteristics of commercial bank asset and liability portfolios have changed from their levels in the early 1970s. This may also suggest that the risk preferences of those who make commercial bank strategic decisions have likewise changed. Most of the conventional literature with respect to investment decisions suggests that individuals tend to be either consistently risk averse or risk seeking. According to expected utility theory, if an individual prefers alternatives with less variance (or less risk), the ranking of alternatives will not be changed even if the alternatives are linearly transformed (a constant added to or subtracted from all possible outcomes). But it appears that greater risk is now more readily accepted in the banking industry, perhaps in much the same way as McGlothlin [18] observed that race track bettors more readily accept greater risk in the later races of the day in order to increase their chances of achieving a target outcome of zero losses. Therefore, it is not clear that conventional expected utility theory can satisfactorily explain the perceived shift in risk preferences of bank managers.

Another body of literature rejects the concept of risk as a measure of dispersion about the expected value of a given distribution (variance = V) and adopts the concept of risk as a function of the likelihood of not achieving a target or goal (R(t)). For a given distribution, V does not change even if the distribution is linearly transformed. In a banking context, variability of return of earning asset alternatives will not change even if, e.g., the cost of funds increases, ceteris paribus. However, if the distribution of returns is defined as net of the cost of funds, an increase in the cost of funds will cause all possible return outcomes to decrease. In other words, all distributions will shift to the left, but the risk of each distribution (as defined by V) will be unchanged.

When risk is defined as R(t), an increase in the cost of funds will, again, cause all distributions to shift to the left. Since R(t) is not a measure of variability about the mean, but is rather a function of the probability of not achieving a target outcome, a linear transformation of alternative distributions can change the value of R(t). If a target rate of return (net of cost of funds) is identified, and a specific distribution is observed to have some or all outcomes (net of cost of funds) above this target, R(t) will have a particular value. If the cost of funds increases and the net target rate of return remains the same, this specific distribution will shift to the left. The result will be that fewer outcomes will lie above the target. The probability of achieving the target rate of return has decreased. Therefore, risk associated with this distribution, as measured by R(t), will increase, even though V will not change. Unlike V, which does not change for a given distribution, R(t) may very well change for a given distribution causing a previously risky (higher V) distribution to be perceived as less risky (because it offers a higher probability of achieving the new higher target).

A frequently cited objective of commercial bank management is to maximize the yield spread, the difference between the cost of funds and the rate of return on earning assets. However, increasing deposit and other borrowing rates exert considerable pressure on yield spread. If, during a given investment period, it appears that spread expectations will not be met because of such pressure, a reasonable reaction may be to adjust the asset portfolio so that higher gross asset returns can be realized. But higher expected returns will be associated with higher variance of returns. Thus, assets with higher expected return and higher V are selected so that the likelihood of achieving the target spread improves; i.e., risk as measured by R(t) does not increase and may decrease. In this context, an apparent shift in the conventionally-defined risk preference is rational.

This study examines rate of return characteristics of bank asset portfolios to determine whether the perceived increases in risk in the commercial banking industry can be explained by reactions to the prospect of not achieving target returns. Specifically, the study tests whether greater jeopardy of not achieving target returns is associated with the acceptance of greater variability of return. A general outline follows.

a. The study ranks commercial banks in descending order of profitability as of June 30 and places them in groups which appear to be in progressively more jeopardy of not achieving their targets for a given calender year; i.e., it identifies groups of banks characterized by relatively low rates of return and by a relatively high cost of funds. The banks with higher rates of return in the first six months of the year are in a relatively better position to achieve their targeted net rate of return for the year. These banks should be less motivated to accept high variability of return in the second half of the year. The banks with lower rates of return in the first six months may have more motivation to adjust their asset portfolios to meet the targeted return for the year. Since cost of funds is a significant variable controlled primarily by market forces, this is likely to be the most persuasive motivation to accept greater variability of return in exchange for higher rate of return. Therefore, the groups of banks with lower first half earnings per dollar invested should have a higher cost of funds.

b. For each bank in a group, the study measures rates of return on assets and on equity (n observations per statistic) and associated cross-sectional variances of return (one observation per statistic) for the first six months (Period A) of the calendar year being studied. These calculations are then repeated for the second six months (Period B). This establishes variability of return for each group of banks in Period A and Period B.

c. The study then determines whether the variance of each return in period B (V_B) exceeds its counterpart in period A (V_A). If the variance in Period B is greater than that in Period A, the group of banks being observed accepted or sought greater variability of return in the second half of the year. Further, if the banks in greater jeopardy of not achieving target returns as of June 30 are associated with an even greater increase in variability than banks in less jeopardy, the former group may be said to have reacted aggressively to their poor first half performance. This interpretation of the results is consistent with the observation of McGlothlin [18] that race track bettors selected more risky alternatives when it appeared that the target outcome would not be realized.

d. Steps a. through c. are replicated for each group and for several years.

e. The study concludes whether there appears to be consistent evidence each year and over time to support the theory that risk-seeking behavior (in the variance sense) increases when bank managers are confronted with below-target returns at an intermediate time in the performance evaluation period.

f. Implications of the findings are discussed.

CHAPTER 2

LITERATURE REVIEW

This chapter reviews major theories of risky decision making--expected utility theory, mean-variance criterion, and stochastic dominance. These theories have gained widespread acceptance and serve as the basis for the majority of theoretical and empirical work in this area. An alternative theory is then reviewed. The purpose of this chapter is first, to compare the assumptions and implications of these theories. Secondly, the theoretical framework for decision making in existing commercial banking literature is discussed.

2.1 Expected Utility Theory

It is postulated that when financial decisions are made such that expected utility (or satisfaction or contentment, etc.) is maximized, such decisions truly reflect the risk preferences of the decision makers. Further, a linear transformation of all possible outcomes will not change a ranking of alternative investment opportunities when that ranking is based upon expected utility maximization [32].

According to expected utility theory, the domain of the utility function is terminal wealth. The function describes the utility associated with various levels of terminal wealth and it may be linear, concave, or convex in form. A linear utility function suggests that an individual's expected utility is directly related to the expected value of terminal wealth. Since such an individual derives the same utility from a certain amount of terminal wealth as from a gamble with expected value equal to the certain amount, this person is considered risk neutral. If a risk neutral person is offered the opportunity to participate in a fair gamble (one in which the price to play equals the expected outcome of the gamble), there will be indifference between gambling and not gambling.

A concave utility function is one for which a linear combination of the utilities of any two distinct values of terminal wealth is less than the utility of the linear combination of the same two values of terminal wealth. An individual with a concave utility function derives more utility from a certain amount of terminal wealth than from a gamble with expected value equal to the certain amount and is considered risk averse. A risk averse individual will not accept a fair gamble.

A convex utility function is one for which a linear combination of the utilities of any two distinct values of terminal wealth is greater than the utility of the linear combination. If an individual's utility function is convex, less utility is derived from a certain amount of terminal wealth than from a gamble with an equivalent expected value of termninal wealth. Such a person is risk seeking and will accept a fair gamble.

Expected utility is, therefore,

$$(1) \qquad E(u) = \sum_{i=1}^{n} p_i u(x_i)$$

where $E(u)$ = expected utility

p_i = probability of outcome i

x_i = terminal wealth associated with outcome i

When an individual is risk averse, the utility of a certain, riskless amount (in terminal wealth) is greater than the expected utility of a two-outcome gamble whose expected outcome (in terminal wealth) equals the certain amount, or

$$(2) \qquad u(x_e) > pu(x_1) + (1-p)u(x_2)$$

where x_e = expected value of the gamble

$x_1 < x_e < x_2$

p = probability of outcome x_1

In addition, the more widely dispersed are the outcomes, the greater is the difference between utility of the expected value and expected utility of the gamble, or

$$(3) \qquad u(x_e) > pu(x_1) + (1-p)u(x_2)$$

$$>> pu(x_1-k) + (1-p)u(x_2+k)$$

where k = a constant value greater than zero

$x_1 < x_e < x_2$

Equation (3) suggests risk averse individuals dislike variance, since the variance of the first gamble is less than the variance of the second gamble (which yields a lower expected utility). The first preference of the risk averse individual is the certain amount, because there is no risk. His next preference is the first gamble because there is less risk (variance) associated with it than with the second gamble.

Conversely, when an individual is risk seeking, the utility of a certain, riskless amount (in terminal wealth) is less than the expected utility of a two-outcome gamble whose expected outcome (in terminal wealth) equals the certain amount, or

$$(4) \qquad u(x_e) < pu(x_1) + (1-p)u(x_2)$$

And, as before, the more widely dispersed are the outcomes, the greater is the difference between utility of the expected value and expected utility of the gamble, or

$$(5) \qquad u(x_e) < pu(x_1) + (1-p)u(x_2)$$

$$<< pu(x_1-k) + (1-p)u(x_2+k)$$

$$\text{where} \quad x_1 < x_e < x_2$$

Equation (5) suggests that risk seeking individuals like variance. The first preference of the risk seeking individual is the gamble with the greater amount of risk (variance), the second gamble.

When an individual is risk neutral, the inequalities in equations (2), (3),(4), and (5) become equalities. Expected utility theory, of course, extends to risky situations with more than two outcomes, and it is completely generalizable to multiple outcomes and to the comparison of alternative gambles. Further, given a specific utility function, the ranking of alternatives will not change if each outcome is transformed by a constant.

$$(6) \qquad \text{If} \quad u(x_e) > pu(x_1) + (1-p)u(x_2),$$

$$\text{Then} \quad u(x_e+k) > pu(x_1+k) + (1-p)u(x_2+k)$$

Equation (6), the risk averse case, holds also for the risk seeking and risk neutral cases. That is, expected utility is defined up to a linear transformation. Stated another way,

(7) If A is preferred to B, then
A+k is preferred to B+k, and
A-k is preferred to B-k.

2.2 Mean-Variance Analysis

Although expected utility theory is not restrictive with respect to the shape of the utility function, significant theoretical developments in financial theory are based on an assumption of risk aversion. One such example is the mean-variance (M-V) decision criterion [17]. This criterion states that investment alternative F will dominate investment alternative G (FDG) if and only if F has an expected return equal to or greater than G, but a smaller variance.

$$\text{(8)} \qquad FDG \text{ iff } E(F) \geq E(G) \text{ and } V(F) \leq V(G) \text{ with at least one strict inequality}$$

This criterion has been found to be valid either if the individual is risk averse and possesses a quadratic utility function, or if the individual is risk averse and investment returns are normally distributed [17].

It should be noted that if $E(F) > E(G)$ and $V(F) > V(G)$, no dominance may be established by M-V decision criterion.

2.3 Stochastic Dominance

Investment decisions may also be analyzed using stochastic dominance criteria. First degree stochastic dominance assumes only a nondecreasing utility function and is, therefore, less restrictive in its application than is the M-V criterion. According to this rule, distribution F dominates distribution G (FDG) if the cumulative probability of return for F is less than or equal to the cumulative probability of return for G for all levels of return, with at least one strict inequality. (If the cumulative probability of return were the same for all levels of return, the distributions would be identical and a rational investor would be indifferent between the two.) The entire cumulative probability distribution of F, therefore, will lie to the right of or coincide with that of G. This means that FDG if at every level of return, r_o, the probability that the return will exceed r_o is greater for distribution F than for distribution G [17].

As has been noted, no dominance may be established by the M-V decision criterion when E(F) › E(G) and V(F) › V(G). However, F may dominate G using stochastic dominance criteria. Such dominance is consistent with the concept of risk as a function of the likelihood of not achieving a target. F will dominate G if E(F) › E(G) and the probability that the return will exceed the target is greater for distribution F than for distribution G. That is, risk associated with F is less than that of G, even though V(F) may exceed V(G). Further, the assumption of first degree stochastic dominance that utility functions are nondecreasing is not violated by the existence of both concave and convex segments.

2.4 Mean-Risk Analysis

Friedman and Savage [8] noted that the same individuals who buy insurance also buy lottery tickets. Such behavior is equivalent to paying a premium to guard against an uncertain situation (loss of property or livelihood) and simultaneously paying a premium to be involved in an uncertain situation (entering a lottery). Such an individual appears to be both risk averse and risk seeking. Friedman and Savage offer the explanation that individuals behave as if their utility functions have a concave (risk averse) segment followed by a convex (risk seeking) segment. This observation indicates that observable behavior does not appear to be consistent with strictly concave, strictly convex, or strictly linear utility functions.

Swalm [28] estimated the utility functions of 100 corporate executives in a laboratory setting. Of the thirteen representative utility functions illustrated, nine clearly involve a convex segment followed by a concave segment. The domain of these utility functions is the change in wealth (stakes), rather than terminal wealth, and the inflection point (the point where the slope changes) is a change in wealth equal to zero. In addition, the slope of the convex segment (negative quadrant) appears steeper than that of the concave segment. This implies a reference point or target of zero losses. It also implies that a given loss will decrease utility by more than an equivalent gain will increase utility.

The idea that risky investment decisions are based upon a change in wealth rather than on terminal wealth is explored further by Kahneman and Tversky [13]. In a laboratory setting, subjects were given alternatives among which to choose. The first group of alternatives (prospects) contained only positive changes in wealth (outcomes). The second group of prospects were mirror images of the first set (previously positive outcomes were now negative). When positive prospects were presented, risk averse behavior was exhibited in the choice process. However, when negative prospects were presented, the choice process shifted to risk seeking behavior. For example, 95 subjects were given a choice of a gamble for $4,000 with 0.8 probability and $0 with 0.2 probability ($4,000, 0.8), or a certain $3,000 ($3,000). Eighty percent chose ($3,000), the alternative with the lower expected return but a zero variance. When the subjects were asked to choose between the "reflected" alternatives (-$4,000, 0.8) and (-$3,000), 92 percent chose (-$4,000, 0.8), the prospect with a lower expected return and a nonzero variance. The gamble offered a 20% chance of no loss, and was the only way a certain loss of $3,000 could be avoided. This "reflection point effect" adds further support for the existence of utility functions that are concave (risk averse) in the region above a point representing a change in wealth equal to zero, and convex (risk seeking) in the region below the point.

Implicit in the work of Kahneman and Tversky is a target of zero change in "wealth" which separates risk averse behavior in the above-target or "gains" region from risk seeking behavior (in the below-target or "losses" region). Intuitively, this is an appealing point. One's risk preferences may very well be different when faced with only losses than when faced with only gains. However, in a business context, decision makers are frequently faced with a target greater than zero (hurdle rate, breakeven point, etc.). Therefore, in practice, the goal or target may be some positive level.

Payne, Laughhunn, and Crum [22,23] tested Kahneman and Tversky's prospect theory when the reference point or target is an implied zero return and, again, when the target is nonzero and positive by instruction. In a laboratory setting, subjects were presented with pairs of gambles with unequal variance. No target or aspiration level instruction was given. When the gamble outcomes were transformed positively (a positive constant added to all the outcomes), the majority of subjects chose the gamble with the smaller variance. When the gamble outcomes were transformed negatively (a negative constant added to all the outcomes), the majority of subjects chose the gamble with the larger variance. The evidence is clear. The linear transformation of gamble outcomes produced consistent changes in risk preference. The aspiration level or target was implicitly zero losses. Utility appears to be a function of changes in wealth, rather than terminal wealth, and these changes in wealth are evaluated in the context of this aspiration level. Such a utility function is characterized by a concave (risk averse) segment above the target and a convex (risk seeking) segment below the target [22]. When aspiration levels or targets were manipulated through explicit instruction, similar results were obtained. In a subsequent study, these researchers replicated the above-mentioned work. In this later study, however, a nonzero target was suggested in connection with the alternatives. In a business context a positive aspiration level is more consistent with actual decision making [23].

The implication of this work is not only that utility functions are concave above the target level and convex below the target level, thus, violating the assumption of uniform risk aversion, but also that the mean-variance criterion is often violated. Decisions noted in studies by Payne, Laughhunn, and Crum [22,23] do not appear to have been made as if the mean-variance criterion were relevant.

Fishburn [6] offers an alternative evaluation of risk, $R(t)$.

$$R(t) = \int_{-\infty}^{t} (t-x)^{\alpha}\, dF(x) \qquad (9)$$

where $R(t)$ = measure of risk

t = target or aspiration level

α = sensitivity to deviation from target, $\alpha > 0$

$F(x)$ = probability density function of x

Thus, $R(t)$ is not a function of the dispersion of a distribution about its mean, but of the likelihood of outcomes below the target. The positive parameter α measures an individual's attitude toward below-target outcomes. If α is between zero and one, risk increases at a decreasing rate, and a convex utility function for below-target returns is implied.

This may easily be seen by reference to Jensen's inequality. If α is between zero and one, $f(x) = (t-x)^{\alpha}$ is a concave function. Consider a certain loss t-d (distribution F) and a gamble with expected value t-d (distribution G). Since $f(x)$ is concave,

$$\begin{aligned} (10) \qquad \int_{-\infty}^{t} (t-x)^{\alpha} \, dG(x) &< \int_{-\infty}^{t} (t-(t-d))^{\alpha} \, dF(x) \\ &< \int_{-\infty}^{t} (d)^{\alpha} \, dF(x) \\ &< (d)^{\alpha} \end{aligned}$$

OR

expected risk of gamble G < risk of expected value of F

Since the means are equal, GDF, by Fishburn mean-risk criterion. But $V(G) > V(F)$, while $E(G) = E(F)$. In the conventional mean-variance framework, this constitutes risk seeking behavior (convex utility function). Similarly, if α is greater than one, $f(x) = (t-x)^{\alpha}$ is a convex function. For the same two alternatives F and G above,

$$\begin{aligned}(11)\qquad \int_{-\infty}^{t} (t-x)^{\alpha}\, dG(x) &> \int_{-\infty}^{t} (t-(t-d))^{\alpha}\, dF(x)\\ &> \int_{-\infty}^{t} (d)^{\alpha}\, dF(x)\\ &> (d)^{\alpha}\end{aligned}$$

OR

expected risk of gamble G > risk of expected value of F

Since the means are equal, FDG by Fishburn's mean-risk criterion. Since V(G) > V(F), while E(G) = E(F), this constitutes risk averse behavior (concave utility function).

Herein is a theoretical framework in which apparently risk seeking behavior for losses is completely rational. And, in no way, is risk averse behavior for gains violated. It should be noted that Fishburn suggests α will be greater than one in the loss region if loss outcomes are so negative as to be ruinous, with α less than one for the loss region in which losses are non-ruinous.

Laughhunn, Payne, and Crum [16] estimated the α values of 224 managers from U.S., Canada, and Europe. When losses were non-ruinous, they found that for 158 of the 224 managers (71%), α values were less than one. This implies risk seeking behavior for below-target returns. Of the 66 managers whose α values were greater than one, implying risk averse behavior for below-target returns, 21 (32%) were between 1.75 and 2.25, and 43 (65%) were between 1.00 and 2.25. When ruinous losses were introduced to 75 subjects, 48

(64%) switched from risk seeking to risk averse behavior.

Decisions may also be made considering the outcome of past decisions. McGlothlin [18] studied race track parimutuel wagering. He noted that patterns of betting changed during the course of the day. The proportion of winning bettors in a given race appeared to be negatively related to the amount wagered per person in the next race. That is, a lower proportion of winning bettors for a specific race was associated with a relatively higher average wager in the following race. Further, the last (eighth) race of the day was characterized by a predominance of wagers on "long shots." The implication is that losing bettors wagered more on subsequent races and that "riskier" horses were bet on in the last race vis-a'-vis earlier races. It appears that risk preferences changed as the racing day progressed. McGlothlin observed, "The group behaved in a manner such as to increase the variability of their assets as a series of risk-taking events proceeded" [18,p.615].

Tversky and Kahneman [30] explain the behavior of McGlothlin's race track bettors using the concept of the "decision frame." The term is used "to refer to the decision-maker's conception of the acts, outcomes, and contingencies associated with a particular choice" [30,p.453]. In the race track context, decision makers appear to have included past losing outcomes in their decision frame. Their "reference point" was not the status quo at the beginning of the last race; i.e., the bettors were not operating from a neutral position in which earlier losses had no impact on the decision with respect to the eighth race. Rather, their reference point or aspiration level or target appeared to be the status quo that existed prior to the first race of the day. The outcome of each race was added to the bettor's decision frame. McGlothlin observed higher wagers for a particular race when the preceding race had a greater number of losers. This suggests that as cumulative losses grew, on average, the amount of the wager grew (to offset the cumulative losses). After the seventh race, those bettors with large cumulative losses were clearly operating from the loss region. In order to return to the status quo which existed before the first race, high risk alternatives (long shots) were selected. At least these alternatives offered a positive probability of reaching the target outcome for the day. If such long shots were not selected, the bettor would remain in the loss region with certainty. Tversky and Kahneman argue that the reference point is critical in choices among risky alternatives; that it is "sometimes set by social norms and expectations" [30,p.456] and that it "sometimes corresponds to a level of aspiration, which may or may not be realistic" [30,p.456].

The implication of this form of risk analysis for commercial bank managers is that a given aspiration level or target return may apply not only to prospective decisions and their outcomes, but to past outcomes within a well-defined target period as well. If it appears that the decision frame is defined by a period of time that encompasses both outcomes of past decisions and outcomes of future events, the psychological account described by Tversky and Kahneman [30] includes not only the consequences of actions to be taken in the future, but also the consequences of past actions. Should the net effect of past decisions to-date constitute an above-target result, bank managers should exhibit risk averse behavior in the remaining time segment of the decision frame to preserve the integrity of this accomplishment. However, if the net effect to-date constitutes a below-target result, bank managers will face a certain below-target outcome for the period unless action is taken to more than offset the current deficiency. The higher return alternatives which offer a chance to overcome the cumulative below-target result will also be characterized by higher variances.

2.5 Risk Preferences - Banking Literature

Theoretical banking literature (as well as investments literature) is frequently developed using an assumption of risk aversion. Santomero [26] has noted that linear (risk-neutral) or concave (risk-averse) utility functions have been considered appropriate for bank management, but that "credible arguments have been offered in favor of the assumption of utility function concavity. The traditional corporate finance explanation rests upon the assumption that management is responsible for decision-making and its inability to diversify its human capital" [26,p.582]. In fact, Santomero [25] developed a model of the optimal portfolio of fixed and variable loans based on an assumption of concavity.

Blair and Heggestad [1] studied the impact of bank portfolio regulation by government agencies upon the probability of bank failure. These researchers developed an efficient investment frontier and utilized the assumption of risk aversion (the degree of which could vary) to argue that the probability of bank failure could be increased through improper bank portfolio regulation.

Ho and Saunders [11] incorporated the concepts of hedging and expected utility theory to explain bank interest rate margins. Their analysis suggested that bank interest rate margins depended upon, among other things, the degree of risk aversion of bank management.

References to risk averse and risk neutral behavior in the banking literature are abundant, but the existence of risk seeking behavior has not been investigated. If the existence of risk seeking behavior in the banking industry can be established, and if circumstances can be identified under which this behavior can be observed, models can be better modified to describe investment decisions. In addition, regulators will be better equipped to monitor the safety and soundness of the banking system as a whole.

CHAPTER 3

PRESENT STUDY

3.1 Overview

The study herein tests the validity of prospect theory proposed by Kahneman and Tversky [13] in the context of the banking industry. Prospect theory suggests that decisions are made based upon a value function (utility function) which is concave (risk averse) for above-target outcomes and convex (risk seeking) for below-target outcomes. The study also incorporates the concept of a psychological account to broaden the decision frame. The decision frame is defined as the acts, outcomes, and contingencies associated with a set of alternatives. The psychological account broadens the decision frame from the consequences of prospective decisions to be made to a more inclusive set of consequences of past and prospective decisions that influence the results over a specific period of time [30]. The period of time to be so analyzed is the calendar year (also the fiscal year for virtually all commercial banks). The first six months of a given year will represent the first "race" of the day and will be associated with either a cumulative above-target result or a cumulative below-target result. The second six months of the year will represent the second and last "race."

Prospect theory predicts that an increase in variability of return in the second six months will be directly related to the extent to which the first six months of the year represent a cumulative below-target result.

The one-year decision frame is a reasonable one. Results of operations are reported to shareholders of banks on a year-to-date basis each quarter. The cumulative annual report represents the major vehicle through which the shareholder is informed of management's performance. Typically, the performance of the current year is compared to the performance of past years. The future objectives of management are also defined in the context of a 12-month period. For example, the management of NCNB Corporation identified its future objectives in the 1986 annual report. The period of time associated with the enumeration of management's objectives was the 12-month period of 1987. In accessing the relative performance of various banking organizations (and others as well), annual results form the basis for the comparison. Hence, the one-year decision frame is intuitively appealing and is relevant to the industry being observed.

The target return is clearly central to the development and testing of prospect theory. In laboratory studies [13, 16, 22, 23, and 30], the target is implicitly zero losses or a positive value suggested through explicit communication. In the commercial banking industry, as in other industries, the target is not likely to be zero loss or break-even.

Instead, some positive target is certain to be the appropriate measure. In the banking industry, a rate of return on assets and a return on equity are the likely candidates. There is a traditional industry benchmark of a 1% return on assets on an annual basis.

However, this 1% benchmark may be inappropriate for smaller banking organizations. Smaller banks tend to have higher returns on assets than money center banks. But because the smaller banks tend to be less highly leveraged, they also tend to have lower returns on equity than money center and regional banks. Even within size categories of banks, there is not necessarily a consensus as to the appropriate target. In 1980 and 1981, a large regional Texas bank holding company had as its objective or goal a 15% annual growth rate in assets and earnings and a consolidated return on assets of 1%. In its 1986 annual report, NCNB Corporation identified a goal of at least 10% annual growth of earnings and reported realized returns on assets and equity for the most recent five years.

The point is, a single target for all banking organizations is a concept which cannot be operationalized. In fact, the identification of a single target or aspiration level in any industry is virtually impossible. This difficulty explains the nonexistence of empirical tests of prospect theory in nonlaboratory settings.

But the difficulty of identification does not invalidate the notion that target returns exist. It merely complicates the measurement process. To circumvent the measurement problem, this study is constructed to differentiate banks that, as of midyear, are in greater jeopardy of not achieving target returns from those that are in less jeopardy of not achieving target returns. Since the calendar year is the customary accounting period for commercial banks, June 30 represents a midpoint in the accounting period. It is also an opportunity to access the outcomes of past decisions in the psychological account (first six months) and the role that future decisions (second six months) will necessarily play in the realization or nonrealization of target returns.

If the first six months find the bank in a below-target position, the results for the year are likely to be below-target with certainty unless a deliberate strategy is adopted to correct the situation. The selection of higher risk (variance) investments for the second six months at least offers a possibility of reaching the target return. Conversely, if the first six months find the bank in an above-target position, selection of investments with substantially higher risk would not be indicated since such selection could endanger the accomplishments of the first six months.

The differentiation of banks in greater jeopardy of not achieving target outcomes from those in lesser jeopardy is accomplished by ranking the banks in order of descending profitability as of June 30. The measure of profitability is rate of return defined in various ways. Several rates of return on assets and a single rate of return on equity are utilized.

Ranking the banks in this way makes it possible to avoid establishing a specific target. The establishment of a specific target would be arbitrary at best and could lead to grossly misstated conclusions. On the other hand, if a bank ranks very high (has a relatively high June 30 rate of return), the probability that the bank is in the below-target region as of June 30 is small. This bank is likely to have realized relatively high rates of return with relatively low cost of funds. Since the rates of return used in the study are net of all expenses (including cost of funds), a relatively high rate of return implies a relatively low cost of funds. If a bank sustained a high rate of return while facing a high cost of funds, this would imply investments in earning assets with uncharacteristically high gross rates of return.

The primary earning assets of banks are securities and loans. The type of securities in which banks are permitted to invest are "investment quality" debt securities. The high quality of these securities causes their yield to be low relative to other debt securities. These securities provide liquidity for banks and a certain amount of income. But the largest classification of earning assets held by banks is loans. Loans comprise more than one half of all earning assets for the industry as a whole. This is clearly the most significant source of income. Further, the loan market is competitive and banks must be sensitive to loan pricing policy so as not to erode their respective market shares.

Therefore, if a bank is to sustain uncharacteristically high gross rates of return on earning assets in order to pay a high cost of funds, the quality of the loan portfolio is compromised. Income from securities cannot be significantly increased for the long term since investment is restricted to high grade securities. High quality loans must be priced competitively. The primary flexibility which exists is to charge higher interest and fees on loans. But higher interest and fees can ony be justified if the borrowers are more risky. While this scenario may be feasible for the short run, it cannot be sustained long term for an individual bank and certainly not for the entire industry. The association of high rates of return with low cost of funds is, therefore, a reasonable one. Similarly, expecting to observe relatively low rates of return in association with high cost of funds appears to be reasonable.

The above-described relationships between cost structure, rate of return structure, and above- or below-target position are intuitively appealing. However, they are not the only possibilities. It is possible to observe a high realized rate of return which is accompanied by a high cost of funds and is below target. Aggressive banks may offer competitively high deposit rates to attract funds, causing average cost of funds to be high. Such organizations may also aggressively seek to create income from credit cards and other fee-generating services. The result is that high net rates of return are established as targets or aspiration levels. These relatively high targets are the result of an aggressive management style. In this context, it is possible that a high realized rate of return may be accompanied by a high cost of funds. Because of the emphasis on relatively high-interest credit cards and other fee-generating income sources, the target rate of return may also be high and the high realized rate of return may still be below target.

It is also possible that banks with low realized net rates of return may be operating above their targets. Such banks may have a low cost of funds, and very little emphasis on credit cards, etc. Their management style may be quite conservative. They may offer low deposit rates (and, thereby, have a low cost of funds) and have a relatively simple interest and fee structure (de-emphasizing credit cards and fee-generating income sources). Such banks would be in a relatively low risk business and would establish a relatively low net rate of return as target.

It is necessary to establish that low realized rates of return and low cost of funds do not imply above-target results and that high realized rates of return and high cost of funds do not imply below-target results. If these combinations do exist consistently, prospect theory will not accurately predict behavior using the ranked groups as described above. It is also important to remember that near-target positions are near the inflection point of the utility function. At the inflection point or target, the function is not continuous and not differentiable, i.e., not well defined.

Therefore, it is necessary to add a measure of assurance that high realized rates of return can reasonably be assumed to be above target and that low realized rates can reasonably be assumed to be below target. If high returns can be associated with low cost of funds, the assumption that such returns are probably approaching above-target results gains even more credibility. Similarly, if low returns can be associated with high cost of funds, the assumption that such returns are below target is further supported.

To validate the relationship of high rates of return with low cost of funds, Kendall's tau rank correlation is used. This statistic measures the correlation between two rankings. If a set of observations is ranked first by one variable and then by a second variable, and the resulting rankings are identical, the value of Kendall's tau is +1. The rankings are said to be perfectly positively correlated. If the rankings are exactly opposite or reversed, the value of Kendall's tau is -1. The rankings are said to be perfectly negatively correlated. The expectation is that rankings by cost of funds will be negatively correlated with rankings by rate of return. This result would support the notion that banks with high realized rates of return tend to have low cost of funds and those with low realized rates of return tend to have high cost of funds.

Those banks with low first half rates of return are in greater jeopardy of not reaching target returns than those with high first half rates of return. They are in a position comparable to that of the race track bettors in McGlothlin's study [18] at the end of the seventh race. The difference is that there are only two "races" for these banks, the first that ends June 30 and the second that ends December 31. If choices are made for the second race (second six-month period of the year) that bring them to the above-target region, any attendant risk taking will have been worthwhile. There is no guarantee that the result will be favorable. But if no investment adjustment is made, December 31 will likely find these banks in the below-target region. Banks with first half rates of return in the above-target region will be motivated to act in such a way as to preserve this advantage.

If the behavior of the bank management is consistent with that noted in laboratory experiments and McGlothlin's race track bettors, above-target first half results should induce risk averse behavior which, in turn, would be reflected in investment decisions for the second half of the year. Similarly, below-target first half results should induce less risk averse, or even risk seeking behavior. This behavior should be detectable during the second half. The method of detection is the observation of changes in variability of rate of return in the second half vis-a'-vis the first half. From the perspective of the bank managers, variance of return is not necessarily the measure of risk that is germane. The risk of not achieving target returns may be much more relevant for them. However, variability of return is crucial to this study because it is the basis for traditional definitions of risk averse and risk seeking behavior.

The hypotheses of the study are based upon the change in variability of return. If first half results are below-target for a group of banks, prospect theory predicts that the group will make second half investment choices characterized by significantly greater variability than the first half choices. On the other hand, if first half results are above-target, second half investment choices will be characterized by variability less than or equal to that associated with first half choices. In addition, the interperiod changes in variability of return for the latter groups (above-target returns at June 30) will be less than the interperiod changes in variability of return for the former group (below-target returns at June 30).

3.2 Test Period and Subjects

3.2.1 Data Base and Test Period

The data base for the study is the semiannual Reports of Condition (balance sheets) and Reports of Income (income statements) for all U.S. banks which periodically report to the Federal Reserve Board System and to the Federal Deposit Insurance Corporation. The number of such banks is approximately 14,000. The period tested is 1979 through 1985. This period is significant because it includes both the environment of rapidly increasing and volatile interest rates of the late 1970s and early 1980s and the "deregulation era" of the 1980s.

Reports of operations through June 30 and through December 31 of each year studied are utilized to derive realized rates of return for the first and second halves of each year studied. Six-month periods appear to be sufficiently long to allow for portfolio adjustments by bank management. Ho and Saunders [11] developed a model to explain bank interest rate margins, assuming a one period decision model. The period used in their study was one quarter period (three months), so six months (two quarters) should be more than adequate.

Flannery [7] conducted a study of commercial bank profits and market interest rates. He concluded that the average duration of assets is less than that of liabilities; i.e., that large commercial banks lend short and borrow long, "though the maturity differences are not large" [7,p.1093]. He estimates the average maturity of large bank asset portfolios to be 1.26 years. This, then, supports the use of a relatively short period of time to measure asset portfolio adjustments, and two quarters should be reasonable. In this study, the first six months of each year studied are referred to as "Period A," and the second six months as "Period B."

3.2.2. Classification of Subjects

For each year studied, banks are ranked in descending order of year-to-date realized rate of return as of each respective June 30. Four separate measures of rate of return are used for ranking purposes (three return on asset measures and one return on equity measure--see Chapter 3, sections 3.3.1 and 3.3.2). The rankings are done to identify groups of banks that, at midyear, are most likely to be in jeopardy of realizing below-target returns. Income alone cannot be used for this ranking because such figures are not comparable from one bank to another. Dividing applicable income by total assets (or total equity) yields a measure of return per dollar invested. This ranking process eliminates the difficult task (both theoretical and practical) of identifying the appropriate target or reference point. Target rates of return are positive but may vary from bank to bank.

As mentioned above, the rankings are intended to assist the identification of those banks with relatively low rates of return. Ceteris paribus, such banks will have relatively more difficulty meeting any given target rate of return. However, it is conceivable that banks with low rates of return also have low targets or low cost of funds. Should this be the situation, a bank could be classified as being in jeopardy of not achieving its target when such is not really the case. (See section 3.1 for a complete discussion of this issue.)

To verify that the descending rate of return rankings imply increasing costs of funds, rankings by cost of funds are compared to rankings by rate of return. Cost of funds is defined as the cost of nonequity funds, i.e., the ratio of total interest expense to the sum of deposits and other interest-bearing liabilities. Equity funds (common and preferred stock) represent on the order of 5-10% of total liabilities and shareholders' equity for the commercial banking industry as a whole. Hence, the omission of the equity component of cost of funds facilitates ease of computation and does not materially distort the results.

If low realized returns are associated with a high cost of funds, the rankings should be negatively correlated. The rank correlation of the population of banks for each year is measured using Kendall's tau [15]. The values of this statistic range from +1 (when rankings are identical) to -1 (when rankings are exactly reversed). A zero value indicates no correlation. A negative value indicates that banks with low rates of return tend to have high costs of funds, and are, therefore, in relatively greater jeopardy of not reaching target returns (however defined).

Once the hypothesized relationship between rates of return and cost of funds has been validated, the population of banks for a given year is divided into deciles for each of the four descending rate of return rankings. Each decile contains approximately 1400 banks. By definition, one tenth of the population of all banks being studied is contained in each decile. When analyzing deciles, it is possible that some differences between the groups may be "random" variations that can be attributed to the size of the sample being observed. To eliminate the affect of this random variation, the population of banks for a given year is also divided into quartiles for each of the four descending rate of return rankings. Each quartile contains approximately 3500 banks.

3.3 Test Statistics

3.3.1 Returns on Assets

Three measures of return on assets are used. The differences correspond to the three levels of income reported by commercial banks. (See Flannery [7].)

(12) ROA1 = Net operating income/average total assets

(13) ROA2 = Net income before extraordinary items/average total assets

(14) ROA3 = Net income/average total assets

"Net operating income" does not include gains or losses from securities transactions or extraordinary (nonrecurring) items. "Net income before extraordinary items" includes gains or losses from securities transactions but not extraordinary items. "Net income" is all-inclusive. The denominator of the above ratios is the arithmetic average of beginning-of-period and end-of-period total assets. Since income is earned throughout the year, a rate of return that is calculated using an average investment is more representative of the true earning power of the investment. If assets or equity are increasing over time, use of the ending balance (highest for the period) tends to understate the rate of return. Use of the beginning balance (lowest for the period) tends to overstate the rate of return. (Gilbert [9] has criticized banking researchers for using end-of-period balance sheet amounts when calculating rates of return.)

The three measures of asset return used in this study are intended to shed light on the source of any observed increases in variability. Are they attributable to portfolio adjustments which change interest and fees on loans and securities (which would be reflected in net operating income), to purchases and sales of securities, or to extraordinary items?

Each return on asset measure is calculated for each bank for Period A, and again for Period B for a given year. The observations are ranked in descending order three times--by Period A ROA1, ROA2, and ROA3. Each ranked set of observations is separated into deciles and then into quartiles. In addition, a mean return is calculated in each decile and in each quartile for both Period A and Period B. In other words, for each decile within each ranking, the mean rate of return is calculated for each of the three above-mentioned statistics in Period A and in Period B. This is also true for each quartile within each ranking.

The mean return must be calculated for each group in order to determine the variance of return. In this respect, the calculation is a necessary preliminary step in the testing. But the mean return is also an additional instrument that can be used to gain further insight into the dynamics of risky decision making. The rate of return in Period B is the result of the risky choices made after June 30. In laboratory experiments testing prospect theory, high variance gambles were frequently selected because they offered a chance to achieve target returns. Would the gambles have accomplished the objective? This is not known. What is known is that the gambles offered the opportunity to reach the target.

At June 30 of each year studied, this opportunity again exists for banks' management to achieve target returns. However, unlike gambles in laboratory settings, the results of decisions made after June 30 may be observed. When Period A and Period B mean returns are compared within each group, it is possible to gain some insight into the outcome of the decisions made after June 30. On average, is Period B performance better than, comparable to, or not as good as Period A performance?

Ex ante it is not possible to predict the answer to this question. The subjective probability distributions of the June 30 alternatives are observable only by the banks themselves. Without these probability distributions an expectation of mean return cannot be developed. Nonetheless, the Period B results provide supplementary data for the interpretation of the test of changes in variance. Changes in mean return are analyzed for rates of return on assets and on equity. (See the following section for a discussion of return on equity.)

3.3.2. Return on Equity

One measure of return on equity is calculated for each bank in Period A and again in Period B.

(15) ROE = Net income/average total equity

The denominator of this ratio is the arithmetic average of beginning-of-period and end-of-period total equity [preferred stock, common stock, surplus (additional paid-in capital), undivided profits (retained earnings)]. The observations are also ranked by Period A ROE and separated into deciles and quartiles. In addition, a mean return in each decile and in each quartile for Period A and for Period B is calculated.

3.3.3. Variance of Return

The computations for each year described in sections 3.3.1 and 3.3.2 yield a set of observations separated into four decile groups (based on rankings by four different ranking variables--Period A ROA1, ROA2, ROA3, and ROE) and four quartile groups (based on the same four rankings). All observations are common to all eight groups. The difference between the groups is the ranking variable and the basis for group formation (decile or quartile). Within each of the four decile groups, the variance of return in Period A and Period B is calculated by decile for each variable. Quartile variances are generated in the same manner. For each decile or quartile

(16) $$V = \sum_{i=1}^{n} (r_i - \bar{r})^2 / (n-1) \qquad [20]$$

where V = variance of return (VROA1, VROA2, VROA3, or VROE)

r_i = return as calculated by (12), (13), (14), or (15) for bank i in the decile or quartile

$\bar{r}$ = the mean return for the decile or quartile ($\overline{\text{ROA1}}$, $\overline{\text{ROA2}}$, $\overline{\text{ROA3}}$, or $\overline{\text{ROE}}$)

n = number of banks in the decile or quartile

The resulting statistics for each year and each ranking are given in Table 3.1. Each ranking within a given year yields data for 40 decile variance comparisons and for 16 quartile variance comparisons (VROA1A to VROA1B, VROA2A to VROA2B, VROA3A to VROA3B, and VROEA to VROEB, by decile or by quartile). Since there are four rankings per year, there are data for a total of 160 decile variance comparisons and 64 quartile variance comparisons each year. The results of the comparisons for ROA3 and ROE are discussed in Chapter 5. The results of comparisons for ROA1 and ROA2 are included in the Appendices S through V.

TABLE 3.1

VARIANCE STATISTICS

DECILES

	PERIOD A				PERIOD B			
DEC	VROA1	VROA2	VROA3	VROE	VROA1	VROA2	VROA3	VROE
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

QUARTILES

	PERIOD A				PERIOD B			
QRT	VROA1	VROA2	VROA3	VROE	VROA1	VROA2	VROA3	VROE
1								
2								
3								
4								

3.4 Hypotheses

3.4.1. Test of Interperiod Differences

For each variable and decile or quartile, the variance of Period B is compared with the variance of Period A.

(17)
$$H_o: \sigma_B^2 = \sigma_A^2$$
$$H_a: \sigma_B^2 > \sigma_A^2$$

where σ_B^2 (σ_A^2) = applicable decile or quartile variance of return in period B (period A)

The test statistic is

(18)
$$F = S_B^2 / S_A^2 \sim F_{n_1 - 1, n_2 - 1} \qquad [20]$$

where S_B^2 (S_A^2) = the sample variance of the applicable decile or quartile in Period B (A)

The null hypothesis will be rejected if

(19)
$$F > F_{n_1 - 1, n_2 - 1, \alpha}$$

The hypotheses in Chapter 3, section 3.1 will be supported if

1. The null hypothesis in equation (17) is rejected for higher deciles and quartiles. In other words, groups of banks with relatively lower first half rates of return have consistently higher variances in Period B than in Period A, and
2. The F statistics are consistently larger for higher deciles and quartiles (lower first half rates of return) than for lower deciles and quartiles (higher first half rates of return), indicating a greater shift to risk-seeking behavior for the former group than for the latter group.

It should be noted that, presumably, any existing seasonal factors should affect all banks in a similar fashion.

3.4.2. Inferences Over Time

The next set of tests attempts to determine whether the results in section 3.4.1. imply consistent interperiod differences in variability changes within each decile or quartile for a particular variable or are simply random occurrences.

Each year yields decile F statistics (see section 3.4.1) for a given variable (ROA1, ROA2, ROA3, or ROE). Since there are four rankings (see sections 3.3.1 and 3.3.2), there is a total of four sets of decile F statistics for a given variable. The variable used to rank the observations may have some effect on the value of the F statistics. To control for this possibility, F statistic comparisons over time are restricted to a given variable (ROA1, ROA2, ROA3, or ROE) within a specific ranking (either Period A ROA1, ROA2, ROA3, or ROE). Since each variable is calculated in the same way and the decile statistics are the product of the same ranking process, only variables specified in this way will be used for a given test. Seven years are studied. Therefore, there are seven sets of decile statistics in each test. Quartile F statistics are tested using the same logic.

If the F statistics for a given testing group are not related to the decile in which they occur, there should be no particular pattern with respect to the value of the F statistics. Half of the F statistics have a value greater than the median value and the other half have a value less than the median. The median F statistic should have the same probability of appearing in decile 2 as in decile 10. Further, the seven F statistics for a given decile (one for each year) should not be either consistently greater than or less than the median F statistic for the group.

The null hypothesis is that F values associated with a particular variable ranked in a particular way will fall above or below the median value uniformly over time and be unaffected by the decile or quartile in which the F value appears. For example, ROA1 statistics ranked by ROA1A result in 10 deciles and 10 F values per year. Over the seven years studied, there is a total of 70 such F values--7 from decile 1, 7 from decile 2, etc. If decile value is not related to F value, on average 3.5 F values (50%) from decile 1 should occur above the median F value and 3.5 below. The same should be true for the other deciles. In other words, the null hypothesis is that F values are independent of the decile or quartile in which they appear. Under the null hypothesis, utilizing a contingency table, the (row) probability of an F value from a decile analysis (with a total of 70 F values) occurring in a particular decile is 0.10. The (column) probability of the F value being either less than or greater than the median F value is 0.50. The probability of such an F value occurring in a particular decile and being either less than or greater than the median F value is the joint probability (0.10)(0.50) = 0.05. Thus the null and alternative hypotheses for decile analysis may be stated

$$H_o: \quad P_i = 0.05 \qquad (20)$$

$$H_a: \quad P_i \neq 0.05$$

where P_i = probability of an F value originating from decile i and lying either above or below the median F value

Thus, the expected number of observations in any cell of a decile contingency table so constructed is 3.5 (0.05 x 70).

For quartile analyses, for a particular statistic ranked in a particular way, there are four quartiles per year, resulting in 28 F values. Under the null hypothesis, the probability of such an F value occurring in a particular quartile and being either less than or greater than the median F value is the joint probability (0.25)(0.50) = 0.125. Null and alternative hypotheses for quartile analyses are

(21)
$$H_o: P_j = 0.125$$
$$H_a: P_j \neq 0.125$$

where P_j = probability of an F value originating from quartile j and lying either above or below the median F value.

Again, the expected number of observations in any cell of a quartile contingency table so constructed is 3.5 (0.125 x 28).

The test statistic is

(22)
$$\chi^2 = \sum_{i=1}^{n} [O_i - E_i]^2 / E_i \sim \chi^2_{(r-1)(c-1)}$$ [20]

where n = total number of cells in a given contingency table

O_i = number of observations in a given cell of the contingency table

E_i = expected number of observations in a given cell of the contingency table

r = number of rows (10 for decile analyses, 4 for quartile analyses)

c = number of columns = 2 (below median, above median)

The null hypothesis will be rejected if

(23)
$$\chi^2 > \chi^2_{(r-1)(c-1),\alpha}$$

If the null hypothesis is rejected, this will provide convincing evidence that the change in variability of return from Period A to Period B is related to decile or quartile value, i.e., the likelihood of not achieving target return.

CHAPTER 4

DATA MANIPULATION

4.1 Objectives

The data manipulation performed in the study is discussed in this Chapter. There are 3 stages of this process.

> The objective of Stage I of the study is to include in the final raw dataset for each year only those banks for which nonzero data are available at each of these dates.

In order to perform the tests described to in Chapter 3, it is necessary to create a dataset for the year being studied with information from Federal Reserve tapes as of three dates. The tapes provide raw data as of the beginning of the year, as of midyear (June), and as of yearend (December).

> The objectives of Stage II are to calculate the relevant ratios from each year's raw dataset and to establish a negative correlation between cost of funds and rates of return in Period A.

After the "raw" dataset is created, the appropriate ratios are calculated and placed in a ratio dataset. Included for each observation are four rates of return and a cost of funds for the first half of the year (Period A) and the same four measures of return for the second half of the year (Period B). In Chapter 3, section 3.2.2., it is suggested that if realized low returns are associated with a high cost of funds, the rankings should be negatively correlated. Kendall's _tau_ is the appropriate statistic to be used in verifying this relationship. A negative value indicates that banks with low rates of return tend to have high cost of funds, and, therefore, are in relatively greater jeopardy of not reaching their target returns (however defined). Accordingly, at this point Kendall's _tau_ is calculated. (It should be noted that the calculation of the Kendall's _tau_ statistic is accomplished by the SAS software package. The output of this operation is composed of selected statistics only. Therefore, it is necessary to rank the observations again to create the permanent, ranked datasets described below.)

> The objective of Stage III is to rank the ratio observations by each rate of return, assign decile and quartile values and to calculate selected statistics for each rate of return for each decile and each quartile in each ranking.

The observations for each year are then ranked by each of the four rates of return and placed into four ranked datasets. Each ranked dataset is divided into deciles by the addition of another variable indicating decile value. A statistical analysis of each rate of return in each ranked dataset within each decile is conducted. The result is 16 sets of statistical output by decile (four rankings, four measures of return by decile for each ranking). In addition, each ranked dataset is divided into quartiles by addition of still another variable indicating quartile value. A similar statistical analysis is conducted, resulting in 16 sets of statistical output by quartile. All data manipulation through Stage III was accomplished by application of the SAS software package at Northeast Regional Data Center, University of Florida.

4.2 Stage I: Data Conversion from Tape to Disk

For each year information for the three relevant dates is accumulated for each bank using the bank's identification number as the common factor in the three sets of tape data. The majority of the June data is contained on two tapes in identification number order (format 1). The second is a continuation of the first. Therefore, the June tapes were selected as the basis for the raw dataset.

Data as of a given date which is not in the above-mentioned format is contained on one tape, but not in identification number order (format 2). Instead, there are several files. Balance sheet data for a specific bank will appear either in RCON file (banks with domestic offices only) or in the RCFD file (banks with domestic and foreign offices). Income statement data are contained for all banks in the RIAD file.

Each June dataset contains a minimum of the following variables:

NAME	
ID	(seven or eight digit number)
CITY	
STATE	
STATENO	(State number)
YEAR	(Date bank was established)
TAA	(Total assets as of June)
TEA	(Total equity as of June)
DEPA	(Total interest bearing liabilities as of June)
NOIA	(June year-to-date income before securities transactions and extraordinary items)
IBEIA	(June year-to-date income before extraordinary items)
NIA	(June year-to-date net income)
TIEA	(June year-to-date interest expense)
RPT1	(Type of balance sheet report filed)
RPT2	(Type of income statement report filed)

Variables obtained for use as prior data (as of December 31 of previous year, i.e., January 1 of current year) include

NAME4

ID

PTA (Prior total assets)

PTE (Prior total equity)

PDEP (Prior interest-bearing liabilities)

For year-end datasets (for which tapes are typically in Format 2), observations have also been obtained from the RCON and RCFD files (balance sheet). In addition, income statement information has been obtained from the RIAD file. Each observation from the balance sheet files contains a minimum of the following variables:

NAME1

ID

TAB (Total assets at December)

TEB (Total equity at December)

The two groups of observations have been combined and placed in identification number order. Variables obtained from the RIAD file include at a minimum:

NAME2

ID

NOIY (December year-to-date income before securities transactions and extraordinary items)

IBEIY (December year-to-date income before extraordinary items)

NIY (December year-to-date net income)

The balance sheet and income statement observations have been combined to form the third set of observations for each year. If NAME1 (balance sheet) was not equal to NAME2 (income statement), the observation was eliminated.

The line items used to construct these variables for each period are discussed in Appendix P. Also included in this appendix is a summary of the resulting datasets and the number of observations in each.

4.3 Stage II: Ratio Calculations and Tests of Correlation.

For each observation in each year's raw dataset described in section 4.2 and in Appendix P, average balances for Periods A and B are computed

Average Balance	Period	Variable Name	Calculation
Total assets	A	ATAA	(PTA+TAA)/2
"	B	ATAB	(TAA+TAB)/2
Total equity	A	ATEA	(PTE+TEA)/2
"	B	ATEB	(TEA+TEB)/2
Interest-bearing liabilities	A	ADEPA	(PDEP+DEPA)/2

In some instances, banks with negative average equity balances were observed. These negative balances cause difficulties in data interpretation. First, a rate of return based on a negative investment has little, if any, economic meaning. Secondly, negative equity places the bank in the region of possible, if not certain ruin. Laughhunn, Payne, and Crum [16] found that managers faced with ruinous losses behaved in a manner inconsistent with their behavior when they were faced with non-ruinous losses. For these reasons, such observations were eliminated. (See Appendix R for a further discussion of this issue).

Period B income is computed as follows:

Income	Variable Name	Calculation
Income before securities transactions and extraordinary items	NOIB	NOIY-NOIA
Income before extraordinary items	IBEIB	IBEIY-IBEIA
Net income	NIB	NIY-NIA

The following ratios are then formed for each year studied:

Ratio	Period	Calculation
COFA	A	TIEA/ADEPA
ROA1A	A	NOIA/ATAA
ROA1B	B	NOIB/ATAB
ROA2A	A	IBEIA/ATAA
ROA2B	B	IBEIB/ATAB
ROA3A	A	NIA/ATAA
ROA3B	B	NIB/ATAB
ROEA	A	NIA/ATEA
ROEB	B	NIB/ATEB

These ratios have been placed in the following datasets (see Appendix R for explanation of differences between the number of observations in raw data datasets described in Appendix P and the number of observations in ratio datasets below):

Year	Dataset	# of Observations
1979	RAT79.RA79	14028
1980	RAT801.RA80	14104
1981	RAT81.RA81	14211
1982	RAT82.RA82	14128
1983	RAT831.RA83	14027
1984	RAT84.RA84	13937
1985	RAT85.RA85	13900

Kendall's tau correlations have been calculated for all ratios in Period A for each year (see Table 4.1). Ranking by cost of funds (COFA) is negatively correlated with ranking by any of the four rate of return measures for every year studied. This fact supports the hypothesis that low rates of return tend to be associated with high costs of funds. See Appendix Q for a discussion of differences in the degree of rank correlation noted.

Rankings by ROA1A are highly positively correlated to rankings by ROA2A and ROA3A for all years observed (ranging from 0.875 to 0.958). Rankings by ROA2A are even more highly positively correlated to ROA3A rankings; in fact, there are almost perfect correlations (ranging from 0.989 to 0.995). These two observations suggest that relatively more asset rate of return adjustments may be attributed to securities than to extraordinary items on average.

The correlations between ROEA rankings and rankings by the three asset rates of return are positive (ranging from 0.652 to 0.746), but not as strong as those noted above.

TABLE 4.1

KENDALL'S TAU CORRELATIONS
1979 - 1985

	COFA	ROA1A	ROA2A	ROA3A	ROEA
1979					
COFA	1.0000	-0.2498	-0.2484	-0.2494	-0.1449
ROA1A		1.0000	0.9580	0.9512	0.6737
ROA2A			1.0000	0.9920	0.6842
ROA3A				1.000	0.6877
ROEA					1.0000
1980					
COFA	1.0000	-0.2835	-0.2776	-0.2779	-0.1950
ROA1A		1.0000	0.9448	0.9407	0.7072
ROA2A			1.0000	0.9949	0.7276
ROA3A				1.0000	0.7301
ROEA					1.0000
1981					
COFA	1.0000	-0.2362	-0.2339	-0.2341	-0.1682
ROA1A		1.0000	0.9524	0.9474	0.7215
ROA2A			1.0000	0.9942	0.7402
ROA3A				1.0000	0.7429
ROEA					1.0000
1982					
COFA	1.0000	-0.1354	-0.1315	-0.1324	-0.0763
ROA1A		1.0000	0.9488	0.9447	0.7241
ROA2A			1.0000	0.9950	0.7436
ROA3A				1.0000	0.7459
ROEA					1.0000
1983					
COFA	1.0000	-0.0158	-0.0105	-0.0116	-0.0031
ROA1A		1.0000	0.9353	0.9301	0.6943
ROA2A			1.0000	0.9936	0.7219
ROA3A				1.0000	0.7254
ROEA					1.0000
1984					
COFA	1.0000	-0.0616	-0.0604	-0.0619	-0.0714
ROA1A		1.0000	0.9422	0.9326	0.6738
ROA2A			1.0000	0.9889	0.6958
ROA3A				1.0000	0.7020
ROEA					1.0000
1985					
COFA	1.0000	-0.0472	-0.0348	-0.0371	-0.0568
ROA1A		1.0000	0.8829	0.8753	0.6522
ROA2A			1.0000	0.9888	0.7104
ROA3A				1.0000	0.7166
ROEA					1.0000

The less-than-perfect rank correlations between the various measures of return suggest that the analysis of variance changes (Period A vs. Period B) within each decile and each quartile may be sensitive to the variable used for ranking purposes. Accordingly, the observations for each year are ranked by each of the four measures of rate of return (ROA1A, ROA2A, ROA3A, and ROEA).

4.4 Stage III: Rankings, Decile Assignments, Quartile Assignments, Related Statistics

The observations in each ratio dataset (see Chapter 4, section 4.3) have been placed in eight additional datasets: ranked in descending order by each rate of return categorized by decile (four datasets) and ranked in descending order by each rate of return categorized by quartile (four datasets). Classification of the observations into quartiles as well as deciles is done to eliminate any "random" variation of smaller decile groups. See Table 4.2 for names of each year's datasets. The number of observations per decile and per quartile (equal for all rankings within a given year) are shown in Table 4.3.

Within each ranking for a given year, each rate of return variable is analyzed by decile and by quartile. The statistics generated within each decile and each quartile for Period A and for Period B are

1. Mean
2. Standard Deviation
3. Minimum Value

4. Maximum Value
5. Standard Error of Mean (std. dev./square root of n)
6. Sum (summation of observations)
7. Variance

TABLE 4.2

RANKED DATASETS
1979 - 1985

	ROA1A	ROA2A	ROA3A	ROEA
		DECILES		
1979	SRAT791.SRA79	SRAT792.SRA79	SRAT793.SRA79	SRA79E.SRA79
1980	SRAT801.SRA80	SRAT802.SRA80	SRAT80.SRA80	SRAT80E.SRA80
1981	SRAT811.SRA81	SRAT812.SRA81	SRAT813.SRA81	SRAT81E.SRA81
1982	SRAT821.SRA82	SRAT822.SRA82	SRAT823.SRA81	SRAT82E.SRA81
1983	SRA8311.SRA83	SRA8321.SRA83	SRA8331.SRA81	SRA83E1.SRA83
1984	SRAT841.SRA84	SRAT842.SRA84	SRAT843.SRA84	SRAT84E.SRA84
1985	SRAT851.SRA85	SRAT852.SRA85	SRAT853.SRA85	SRAT85E.SRA85
		QUARTILES		
1979	QRAT791.SRA79	QRAT792.SRA79	QRAT793.SRA79	QRAT79E.SRA79
1980	QRAT801.SRA80	QRAT802.SRA80	QRAT803.SRA80	QRAT80E.SRA80
1981	QRAT811.SRA81	QRAT812.SRA81	QRAT813.SRA81	QRAT81E.SRA81
1982	QRAT821.SRA82	QRAT822.SRA82	QRAT823.SRA82	QRAT82E.SRA82
1983	QRA8311.SRA83	QRA8321.SRA83	QRA8331.SRA83	QRA83E1.SRA83
1984	QRAT841.SRA84	QRAT842.SRA84	QRAT843.SRA84	QRAT84E.SRA84

TABLE 4.3

NUMBER OF OBSERVATIONS PER DECILE AND PER QUARTILE
1979 - 1985

	1979	1980	1981	1982	1983	1984	1985
			BY DECILE				
DEC							
1	1403	1410	1421	1413	1403	1394	1390
2	1403	1411	1421	1413	1402	1393	1390
3	1402	1411	1421	1412	1403	1394	1390
4	1403	1410	1421	1413	1403	1394	1390
5	1403	1410	1422	1413	1403	1394	1390
6	1403	1411	1421	1413	1402	1393	1390
7	1403	1411	1421	1413	1403	1394	1390
8	1402	1410	1421	1412	1403	1394	1390
9	1403	1411	1421	1413	1402	1393	1390
10	1403	1409	1421	1413	1403	1394	1390
			BY QUARTILE				
QRT							
1	3507	3526	3553	3532	3507	3484	3475
2	3507	3526	3553	3532	3507	3485	3475
3	3507	3526	3552	3532	3506	3484	3475
4	3507	3526	3553	3532	3507	3484	3475

CHAPTER 5

INTERPRETATION OF RESULTS

5.1 Supporting Documentation

To provide background for the discussion of changes in variance and other statistics, a summary of ranges of rates of return (in decimal notation) by year and by period is provided in Appendix O. A review of this information allows verification of the "reasonableness" of the data as a whole before considering changes by decile or by quartile.

Decile statistics for Period A and Period B have been calculated for each given variable (ROA1, ROA2, ROA3, or ROE) after ranking. For each ranking this yields four sets of decile statistics. Since there are four rankings, the result is sixteen sets of decile statistics for each year studied. To facilitate interpretation of these statistics, summaries have been prepared and appear in Appendices A through G. For each year there are four decile summary sheets, with each sheet containing information with respect to four sets of decile statistics by a particular ranking. The information contained on each summary sheet includes (by decile) percentage changes in mean return, in variance of return, and in coefficient of variation. All percentage changes are in decimals rather than percentages. The last column contains the F value for the decile. Since seven years are examined, there is a total of 28 such summary sheets.

Quartile statistics have been calculated in a manner comparable to that in which decile statistics were calculated. The result is again sixteen sets of quartile statistics for each year studied. Quartile summary sheets appear in Appendices H through N. For each year there are two quartile summary sheets with each sheet containing information with respect to eight sets of quartile statistics (two rankings per page). The information contained therein is the same as that contained in the decile summary sheets. Since seven years are examined there is a total of 14 quartile summary sheets.

An analysis of specific components of the information contained in the above-mentioned summary sheets is provided below in sections 5.2 through 5.4. These sections contain a discussion of the rankings by ROA3A and ROEA and the observed variables ROA3 and ROE in Periods A and B. The rankings by ROA1A and ROA2A are highly correlated with rankings by ROA3A, as noted in Chapter 4, section 4.3. Any comparisons and resulting conclusions are also very similar.

5.2 Changes in Mean Rates of Return

For each year studied, a discussion of the findings with respect to the relationship between changes in mean rate of return (Period A vs. Period B) and decile or quartile value follows. These findings are summarized in Tables 5.1 and 5.2. (Appendix S includes findings for all variables.)

5.2.1 Decile Analysis (Table 5.1)

The value of all decile mean returns (ROA1, ROA2, ROA3, and ROE) is consistently positive for all years studied, all rankings, and for both Period A and Period B for deciles 1 through 8. In decile 9 all mean returns for Period A and Period B are positive for all rankings and for all years studied except 1985. All 1985 decile 9 Period B mean rates of return are negative. In 1979, 1980, and 1981, decile 10 consistently contains negative mean returns in Period A and positive mean returns in Period B. In 1982, 1983, 1984, and 1985, decile 10 mean returns are consistently negative in Periods A and B.

Changes in mean return from Period A to Period B are found to be consistently negative in decile 1. The percentage changes in decile 1 mean return range from a negative 58% (ROE, ranked by ROEA, 1985--Appendix G.4) to a negative 87% (ROE, ranked by ROA3A, 1982--Appendix D.3). Consistently, the percentage changes in mean return in decile 2 are also negative, but less negative than in decile 1. In other words, the percentage changes in decile 2 from Period A to Period B are more favorable than those in decile 1.

For years 1979 through 1982, each succeeding decile exhibits a more favorable change in mean return than the decile immediately preceding it, regardless of the observed statistic or the ranking variable. In years 1979 and 1980, the percentage change becomes positive (i.e., Period B mean exceeds Period A mean) beginning in decile 6, 7, or 8 (see

Appendices A.1 through B.4). In decile 10, the favorable change ranged from 378% (ROE, ranked by ROEA, 1980--Appendix B.4) to 985% (ROA3, ranked by ROEA, 1979--Appendix A.4). The algebraic sign associated with the decile 10 percentage changes is negative, however, since Period A mean return is negative and Period B mean return is positive.

In 1981 and 1982, the same general pattern is observed as noted above. The percentage change in mean return is not positive, however, until decile 9. In decile 10, the favorable change in mean return ranges from 49% (ROE, ranked by ROA3A, 1982--Appendix D.3) to 274% (ROA3, ranked by ROEA, 1981--Appendix C.4). In 1981 decile 10 Period A mean returns are negative and Period B means are positive. In 1982 decile 10 Period A and Period B mean returns are negative.

Beginning in 1983, less consistent trends from decile 1 to decile 10 are observed. In 1983, the percentage changes for ROA3A rankings become less favorable in decile 9 or in deciles 8 and 9 (Appendix E.3). The ROEA ranking exhibits this trend only for the ROE statistic, with the ROA3 statistic in this ranking exhibiting consistently more favorable percentage changes in mean from decile 1 through decile 10 (Appendix E.4). In decile 10, the favorable change in mean ranges from 27% (ROE, ranked by ROA3A--Appendix E.3) to 56% (ROA3, ranked by ROA3A--Appendix E.3), with Period A and Period B mean returns negative in each case.

In 1984, percentage changes for rankings by ROA3A and ROEA become less favorable in deciles 7, 8, and 9 (Appendices

F.3 and F.4). The decile 10 favorable changes in mean range from 14% (ROE, ranked by ROA3A--Appendix F.3) to 42% (ROA3, ranked by ROEA--Appendix F.4). As in 1982 and 1983, the decile 10 mean returns are negative in Period A and Period B.

In 1985, the same trend from decile 1 to decile 10 is noted as for the 1984 rankings by ROEA (Appendices G.3 and G.4). Decile 10 favorable changes in mean range from 14% (ROE, ranked by ROEA--Appendix G.4) to 36% (ROA3, ranked by ROA3A--Appendix G.3). Decile 9, Period B, and decile 10, Periods A and B, are characterized by negative mean returns.

These results are summarized in Table 5.1. In the early years of the study, changes in mean return from Period A to Period B improve from decile 1 to decile 10. Initially, Period B mean returns exceed those of Period A beginning in, perhaps, decile 6, and the percentage changes become even more favorable in higher-numbered deciles (categories 1 and 2). This situation deteriorates in later years of the study. First, while changes are more favorable from decile 1 to 10, only decile 10 is associated with a Period B mean return which exceeds the Period A return (category 3). Later, the changes in mean actually become less favorable in higher-numbered deciles, again with only decile 10 being associated with a Period B mean which is greater than Period A mean (categories 4, 5, and 6). Even this situation in decile 10 deteriorates over time. The improvement in mean return from Period A to Period B in decile 10 ranges from over 600% in 1979 to less than 40% in 1985 (see Appendices A through G).

5.2.2 Quartile Analysis (Table 5.2)

The value of all quartile mean returns (ROA3 and ROE) is consistently positive for all years studied, both rankings and for both Period A and Period B for quartiles 1 through 3. From 1979 through 1982, this is also true for quartile 4. In 1983, all Period A quartile 4 means are negative, as are nine of the Period B quartile 4 means. The 1983 Period B quartile 4 means which are positive are

1. ROA3B ranked by ROA3A
2. ROA3B ranked by ROEA

In 1984 and 1985, quartile 4 Period A and Period B mean returns are consistently negative.

Changes in quartile 1 from Period A to Period B are found to be consistently negative. As is noted in the decile analysis in section 5.2.1 above, quartile 2 is also associated with negative percentage changes in mean return from Period A to Period B, with the percentage changes being smaller in absolute value than those noted in quartile 1. These observations are true for all years studied.

The character of the percentage changes in quartiles 3 and 4 varies over the years studied. In years 1979 through 1982, the percentage change in quartile 3 is either a smaller negative (and unfavorable) change than that in quartile 2, or is positive (and favorable). Quartile 4 is consistently characterized from 1979 through 1982 by a positive (and favorable) percentage change from Period A to Period B.

(Period A mean and Period B mean in quartile 4 are positive for all statistics and all rankings during this period.)

In 1983 and 1984, no quartile 3 percentage change in mean from Period A to Period B is positive and favorable. Further, while the quartile 3 percentage change is negative and unfavorable as noted in some instances in the period from 1979 to 1982, the relationship between the quartile 2 change and the quartile 3 change is markedly different. In the first four years of the study, when the quartile 3 change is negative, it is far less negative than the quartile 2 change. Typically, the absolute value of the quartile 3 change is no more than 50% of the absolute value of the quartile 2 change. In 1983 and 1984, the absolute value of the quartile 3 percentage change is typically no less than 70% of the absolute value of the quartile 2 percentage change. In fact, in 1984, the ranking by ROEA is associated with a percentage change in quartile 3 that is even less favorable than the percentage change in quartile 2.

In 1983 and 1984, ROA3 quartile 4 statistics (both rankings) are characterized by a Period B value that is either less negative than the Period A value or is positive; both situations represent an improvement in mean return from Period A to Period B. However, 1983 and 1984 ROE quartile 4 statistics (both rankings except 1983 ROE, ranked by ROEA) are characterized by a Period B value that is more negative than that in Period A, representing the first instances of deterioration of mean return in quartile 4 that can be noted in the years studied.

In 1985, every quartile 3 percentage change is more negative than its preceding quartile 2 percentage change. Quartile 4 percentage changes are sometimes favorable and sometimes unfavorable.

These results are summarized in Table 5.2. In the early years of the study, quartiles 3 and 4 exhibit Period B mean rates of return which are improvements over Period A mean rates of return, or represent, at least, relatively small decreases vis-a'-vis quartiles 1 and 2 (categories 1, 2, 3, and 4). This result is clearly less evident in the later years of the study (categories 5 and 6).

The decisions after June 30 are reflected in the results for Period B, the second and last "race of the day" for banks being observed. In McGlothlin's study [18], the increased tendency to select the more risky "long shots" is identified. The consequences of the decisions for the last race are not addressed. In this study it is possible to observe the consequences of the "last race."

Banks with relatively high first half results consistently enjoyed much less success in the second half. In the early years of the study, banks with relatively low first half earnings were able to significantly improve profitability in Period B. However, in the later years of the study, this ability by the latter group is no longer apparent. Did the banks with Period A earnings become less risk averse or become risk seeking to achieve the Period B

TABLE 5.1

DECILE ANALYSIS OF CHANGES IN MEAN RETURN 1979 - 1985

YEAR	RANKING VARIABLE	OBSERVED VARIABLE ROA3	ROE
1979	ROA3A	1	2
	ROEA	2	2
1980	ROA3A	1	1
	ROEA	1	1
1981	ROA3A	2	2
	ROEA	2	2
1982	ROA3A	2	2
	ROEA	2	2
1983	ROA3A	3	4
	ROEA	3	3
1984	ROA3A	3	4
	ROEA	5	6
1985	ROA3A	5	6
	ROEA	5	6

Note: All decile 1 percentage changes are negative. All decile 2 percentage changes are smaller negative values. This trend continues except as noted below.

Legend:
1 Period B mean › Period A mean beginning in either decile 6, 7, or 8.
2 Period B mean › Period A mean beginning in decile 9.
3 Period B mean › Period A mean only in decile 10.
4 Percentage change in mean return becomes more favorable from decile 1 to decile 10 except for decile 9 or deciles 8 and 9.
5 Percentage change in mean becomes more favorable from decile 1 to decile 10 except for deciles 4, 7, 8, and 9.
6 Percentage change in mean becomes more favorable from decile 1 to decile 10 except for deciles 6, 7, 8, and 9.

TABLE 5.2

QUARTILE ANALYSIS OF CHANGES IN MEAN RETURN 1979-1985

YEAR	RANKING VARIABLE	OBSERVED VARIABLE ROA3	ROE
1979	ROA3A	1	1
	ROEA	1	1
1980	ROA3A	1	1
	ROEA	1	1
1981	ROA3A	2	2
	ROEA	2	2
1982	ROA3A	2	2
	ROEA	2	2
1983	ROA3A	4	4
	ROEA	3	4
1984	ROA3A	5	5
	ROEA	6	6
1985	ROA3A	6	6
	ROEA	6	6

Note: All quartile 1 percentage changes are negative and all quartile 2 percentage changes are smaller negative values.

Legend:

1 Percentage changes in quartiles 3 and 4 are positive and favorable, with the change in quartile 4 › change in quartile 3.

2 Percentage change in quartile 3 is negative (unfavorable) but is a substantially smaller negative change than that observable in quartile 2. Percentage change in quartile 4 is positive and favorable.

3 Percentage change in quartile 3 is negative (unfavorable) but is somewhat less negative than the percentage change observed in quartile 2. Percentage change in quartile 4 is negative and favorable (Period B mean exceeds negative Period A mean).

4 Percentage change in quartile 3 is negative (unfavorable) but somewhat less negative than the percentage change observed in quartile 2. Percentage change in quartile 4 is positive and unfavorable (Negative Period A mean exceeds Period B mean).

5 Percentage change in quartile 3 is negative (unfavorable) and more negative than the percentage change observed

TABLE 5.2 (cont'd):

in quartile 2. Percentage change in quartile 4 is negative and favorable (Period B mean exceeds negative Period A mean).

6 Percentage change in quartile 3 is negative (unfavorable) and more negative than the percentage change observed in quartile 2. Percentage change in quartile 4 is positive and unfavorable (Negative Period A mean exceeds Period B mean).

results? If so, was there an excessive shift toward risk seeking behavior in the later years which caused the selection of alternatives to be biased toward overly risky alternatives? If not, did bank managers become risk averse? Did the banks with high Period A earnings become too risk averse? Only the accessment of changes in rate of return variability can properly address these questions.

5.3 Changes in Variance of Rate of Return

For each year studied, a discussion of the findings with respect to the relationship between changes in variance of rate of return (Period A vs. Period B) and decile or quartile value follows. These findings are summarized in Tables 5.3 and 5.4.

The F statistics associated with each decile and quartile have been calculated to determine 1) if changes in variance from Period A to Period B are statistically significant, and 2) if the degree of significance is related to decile or quartile value. The critical values at 1% and 5% levels of significance are

Significance	Degrees of Freedom Numerator	Degrees of Freedom Denominator	Critical Value
1%	120	120	1.53
1%	∞	∞	1.00
5%	120	120	1.35
5%	∞	∞	1.00

Sample size in each case exceeded 1400. Therefore, the appropriate value lies within the range 1.00 to 1.53.

A total of 1568 F statistics have been generated: 1120 associated with decile analyses (10 deciles per statistic in each ranking x 4 statistics per ranking x 4 rankings per year x 7 years) and 448 are associated with quartile analyses (4 quartiles per statistic in each ranking x 4 statistics per ranking x 4 rankings per year x 7 years). Of the total F statistics (after manual adjustments in 1981, see Appendix R), 38 (2.4%) were less than 1.53, i.e., were not statistically significant at the 1% level (31 decile F statistics, 7 quartile statistics). Of these 38 F statistics, 20 (1.3% of the total) were less than 1.53 but greater than 1.35; i.e., were statistically significant at the 5% level (17 decile, 3 quartile). The remaining 18 (1.1% of the total) were less than 1.35 but greater than 1.00; i.e., were not significant at the 5% level. It should be noted that the vast majority of F statistics (1530 or 97.6% of the total) were significant at the 1% level.

5.3.1 Decile Analysis (Table 5.3)

Prospect theory predicts that banks in higher-numbered deciles (low Period A returns) will be less risk averse or will be risk seeking in Period B in order to improve their chances of achieving the target returns. Therefore, the expectation is that F statistics in higher-numbered deciles will be larger than those in lower-numbered deciles.

The existence of a relationship between decile value and changes in variance from Period A to Period B each year is investigated by classifying each of the 28 groups (2 rates of return per ranking (ROA3 and ROE) x 2 rankings per year x 7 years) of decile statistics into one of three categories:

1 No pattern. I.e., F statistics appear to have neither an upward nor a downward trend moving from decile 1 to decile 10.

2 Increasing pattern. I.e., F statistics appear to have a definite upward trend from decile 1 to decile 9, although an F statistic in a particular decile may not necessarily be larger than every F statistic in the preceding deciles.

3 Strongly increasing pattern. I.e., F statistics exhibit a clear upward trend from decile 1 to decile 9.

It should be noted that the decile 10 variances in each of the 28 sets of decile statistics are the largest variances in both Period A and Period B. (This is also true for all variables and all rankings, including those not specifically referred to in this section.) Of these 28 decile 10 F statistics (one in each set of decile statistics), 4 (14%) are less than 1.35 but greater than 1.00. The remaining 24 (86%) are statistically significant at least at the 5% level. However, since the variances are so large in Period A and Period B, the decile 10 F statistics are generally not as large as those for deciles 8 or 9. (Refer to Appendices A.1 through G.4.) A possible explanation for this phenomenon is that the managers of banks in decile 10 may be concerned with possible ruin. The prospect of ruinous loss has been shown to cause decision makers to become risk averse [16].

The classification of decile statistics is somewhat subjective. A more rigorous statistical analysis could be accomplished by a regression analysis of decile value and F statistic for each of the 28 groups. However, such an analysis would include only 10 observations (10 deciles). The relatively small number of observations would cause the results of the regression analysis to be less than compelling. Further, in section 5.5 of this chapter, rigorous statistical methods are applied to identify inferences over all years studied, thus removing the subjectivity.

Table 5.3 indicates that 2 (7.1%), 6 (21.4%), and 20 (71.4%) of the 28 decile groups exhibit no pattern (category 1), an increasing pattern (category 2), and a strongly increasing pattern (category 3), respectively. Without regard to statistic or ranking method, 93% (categories 2 and 3) of all decile groups exhibit some sort of increasing trend from lower deciles to higher deciles.

This result is not dependent upon which variable is observed. There are 14 groups of any given observed variable (1 in each ranking per year x 2 rankings per year x 7 years). The percentages of the 14 groups for each observed variable associated with an increasing or a strong increasing pattern (categories 2 and 3) of F statistics range from 86% (ROE) to 100% (ROA3).

This result is likewise not dependent upon the ranking variable. There are also 14 groups of variables for each ranking (2 observed variables per year x 7 years). The percentages of the 14 groups of variables for a given ranking associated with an increasing or a strongly increasing pattern of F statistics (categories 2 and 3) again range from 86% (ranking by ROEA) to 100% (ranking by ROA3A).

These observations appear to support the hypothesis that banks with relatively low rates of return in Period A, i.e., those in relatively greater danger of not achieving target rates of return, are associated with larger changes in variability of return (more risk-seeking or less risk averse behavior) than are banks with relatively high rates of return in Period A, i.e., those in relatively less danger of not achieving target rates of return.

5.3.2 Quartile Analysis (Table 5.4)

The quartile analysis of change in variance also includes 28 groups of F statistics. The difference from the previous section is that each group contains four quartiles rather than ten deciles. The method of classification is similar, but the smaller number of groups makes it possible to be more specific with respect to the relationships of the quartile F statistics. Each group of quartile statistics is classified into one of two categories:

1 Increasing pattern. I.e., F statistic of quartile 3 exceeds that of quartile 2 and F statistic of quartile 2 exceeds that of quartile 1.

2 No increasing pattern. I.e., F statistics cannot be classified as exhibiting an increasing pattern.

For the majority of years studied (1979 and 1982 through 1985), the largest variance for each of the 112 groups (all rankings and all variables) appears in quartile 4 for Period A and Period B. The exceptions are 1980 and 1981. In 1980, most of the largest variances in Period A appear in quartile 1, while the largest variances in 1980 Period B are, again, in quartile 4. In 1981, the largest variances, Period A and Period B, are in quartile 1. The result is that, as was noted in the bottom segment of the decile analysis, the quartile 4 F statistics are generally not as large as those of the preceding quartiles. (Refer to Appendices H.1 through N.2). Again, the prospect of ruinous loss may be operating to induce risk averse behavior.

Table 5.4 indicates that 24 (86%) and 4 (14%) of the 28 quartile groups exhibit an increasing pattern and no increasing pattern, respectively. This classification is without regard to observed statistic or ranking variable.

When each observed variable is considered independently, the percentage of each which exhibits increasing patterns of F statistics (category 1) is 86%. When each ranking is considered independently, the percentages of the 28 groups for a specific ranking associated with an increasing pattern of F statistics range from 79% (ranking by ROA3A) to 93% (ranking by ROEA).

The evidence is clear. In each year studied, variance of return increases in higher-numbered deciles and quartiles with few exceptions. Groups of banks in greater jeopardy of

TABLE 5.3

DECILE ANALYSIS OF CHANGES IN VARIANCE OF RATE OF RETURN 1979-1985

YEAR	RANKING VARIABLE	OBSERVED VARIABLE ROA3	ROE
1979	ROA3A	2	3
	ROEA	3	2
1980	ROA3A	3	3
	ROEA	3	3
1981	ROA3A	2	3
	ROEA	3	3
1982	ROA3A	3	3
	ROEA	3	3
1983	ROA3A	2	3
	ROEA	3	2
1984	ROA3A	3	3
	ROEA	3	1
1985	ROA3A	2	3
	ROEA	3	1

Note: See the first paragraph of section 5.3.1 for an explanation of descriptive categories.

Summary by Observed Variable:

Category	ROA3	ROE
1	-	2
2	4	2
3	10	10

Summary by Ranking Variable:

	Category 1	2	3
ROA3A	0	4	10
ROEA	2	2	10

TABLE 5.4

QUARTILE ANALYSIS OF CHANGES IN VARIANCE OF RATE OF RETURN 1979 - 1985

YEAR	RANKING VARIABLE	OBSERVED VARIABLE	
		ROA3	ROE
1979	ROA3A	1	1
	ROEA	1	1
1980	ROA3A	1	1
	ROEA	1	1
1981	ROA3A	2	2
	ROEA	1	2
1982	ROA3A	1	1
	ROEA	1	1
1983	ROA3A	2	1
	ROEA	1	1
1984	ROA3A	1	1
	ROEA	1	1
1985	ROA3A	1	1
	ROEA	1	1

Note: See the first paragraph of section 5.3.2 for an explanation of descriptive categories.

Summary by Observed Variable:

Category		
1	12	12
2	2	2

Summary by Ranking Variable:

	Category	
	1	2
ROA3A	11	3
ROEA	13	1

not achieving target returns are overwhelmingly associated with greater variability of return in the second half of the year than are banks in less jeopardy. For banks with poor first half performance, choices for the second half are clearly more risky.

In both the decile and quartile analyses, the strongest supporting evidence is offered by the ROE statistic when all variables and all rankings are considered. The decile analysis reveals almost 90% of all ROE observed variable groups exhibit an increasing pattern of F statistics (categories 2 and 3); in the quartile analysis this number is almost 86% (category 1). In the decile analysis, almost 93% of all groups ranked by ROEA can be associated with an increasing pattern of F statistics (categories 2 and 3); in the quartile analysis this number is almost 97% (category 1). This suggests that, if there is a target rate of return, the form of the target may be return on equity. (See Appendix T for all results.)

5.4 Changes in Coefficient of Variation

In section 5.2 of this chapter it is noted that percentage changes in the mean rate of return appear to be related to decile or quartile value and time. In the early years of the study higher decile or quartile values are associated with more favorable changes in mean rate of return than are lower decile or quartile values. This positive association is no longer apparent in later years of the study.

In section 5.3 of this chapter it is noted that higher F statistics and, therefore, larger percentage changes in variance, are generally associated with higher-numbered decile or quartile values, without regard to time. That is, banks in higher-numbered deciles or quartiles appear to be accepting higher risk. If accepting higher risk yields higher return, this is not necessarily irrational behavior. Whether this behavior is rational depends upon the relative increases in rate of return and variability.

The coefficient of variation is a measure of units of variability per unit of return. If the change in this statistic decreases from the first decile or quartile to the last, this would suggest that the acceptance of increases in variability is, on average, better compensated for in higher-numbered than in lower-numbered deciles or quartiles.

The precise measurement that is examined is the percentage change in the coefficient of variation from Period A to Period B:

$$\begin{aligned}\% \Delta C.V. &= (\sigma_B / \bar{k}_B - \sigma_A / \bar{k}_A) / \sigma_A / \bar{k}_A \\ &= (\sigma_B / \bar{k}_B)(\bar{k}_A / \sigma_A) - 1 \\ &= (\sigma_B / \sigma_A)(\bar{k}_A / \bar{k}_B) - 1\end{aligned}$$

Whether the percentage change in coefficient of variation is negative, zero, or positive depends upon the relationship between σ_B / σ_A and $\bar{k}_B / \bar{k}_A$.

If $\sigma_B / \sigma_A = \bar{k}_B / \bar{k}_A \Rightarrow (\sigma_B / \sigma_A)(\bar{k}_A / \bar{k}_B) = 1$, and C.V.=0

If $\sigma_B / \sigma_A > \bar{k}_B / \bar{k}_A \Rightarrow (\sigma_B / \sigma_A)(\bar{k}_A / \bar{k}_B) > 1$, and C.V.>0

If $\sigma_B / \sigma_A < \bar{k}_B / \bar{k}_A \Rightarrow (\sigma_B / \sigma_A)(\bar{k}_A / k_B) < 1$, and C.V.<0

It can be seen from the data in Appendices A through N that most percentage changes in the coefficient of variation are positive. In other words, the Period B standard deviation (and risk) represents a larger multiple of the Period A standard deviation than the multiple which Period B mean rate of return represents of Period A mean rate of return. When observing two deciles (or quartiles), if the first exhibits a higher percentage change in C.V. than the second, the first is associated with a greater percentage change in its standard deviation relative to the percentage change in its mean.

This method of analysis is valid as long as mean rates of return are positive. When either the Period A or the Period B (or both) mean rate of return is negative, the result of this analysis is less meaningful. Accordingly, the following deciles and quartiles have not been included in the interpretation of percentage changes in coefficient of variation since Period A and/or Period B coefficient of variation is negative.

Year	Decile	Quartile
1979	10	-
1980	10	-

1981	10	-
1982	10	-
1983	10	4
1984	10	4
1985	9,10	4

5.4.1 Decile Analysis (Table 5.5)

The categories used to classify the 28 groups of changes in coefficient of variation are similar to those used in analyzing each group of F statistics:

1 No pattern

2 Increasing pattern or first decreasing then increasing pattern

3 First increasing then decreasing pattern

4 Decreasing pattern

5 Strongly decreasing pattern

Table 5.5 indicates 4 groups (14.3% of the total) exhibit no pattern (category 1) and that 13 (46.4%) exhibit an increasing pattern or first a decreasing and then an increasing pattern (category 2). A total of 11 groups (39.3% of the total) exhibit a decreasing pattern in at least the higher numbered deciles (categories 3, 4, and 5).

It is easily noted by referring to Table 5.5 that the later years of the study--1983, 1984, and 1985 (representing 42.9% of all groups)--are associated with 12 groups and that 11 of these (92% of this subset) are characterized as having increasing patterns of percentage changes in coefficient of variation (category 2). In other words, 11 of the 13 increasing pattern groups appear in the last three years of the study. The higher levels of risk (F statistics) that are associated with higher numbered deciles in section 5.3 do not appear to be well compensated for by proportionally higher mean rates of return in 1983, 1984, and 1985.

This phenomenon is not seen in the earlier years of the study. The years 1979 through 1982 are associated with 16 groups, representing 57.1% of all groups. This subset of years is characterized by 4 (25% of the subset) showing no pattern--category 1, 2 (12.5% of the subset) having an increasing pattern--category 2, and 10 (62.5% of the subset) having a decreasing pattern at least in the higher numbered deciles--categories 3, 4, and 5.

More than half of the groups in the early years of the study have been more than proportionally compensated for greater variability in the higher numbered deciles. This clearly does not appear to be the case in the later years of the study.

5.4.2 Quartile Analysis (Table 5.6)

Categories used to classify the 28 groups of quartile statistics are essentially three in number. The second, however, has been modified for those situations in which either the Period A or the Period B coefficient of variation is negative in quartile 4. The modified classification is identified with the suffix "a." The categories are

1 Increasing pattern. I.e., percentage change in quartile 1 is less than that in quartile 2 which is less than that in quartile 3.

2 Decreasing pattern. I.e., percentage change in quartile 2 is greater than that in quartile 3 which is greater than that in quartile 4, or the percentage change in quartile 1 is greater than that in quartile 2 which is greater than that in quartile 4.

2a Decreasing pattern, i.e., percentage change in quartile 2 is greater than that in quartile 3, or percentage change in quartile 1 is greater than that in quartile 2.

3 Strongly decreasing pattern, i.e, each successive quartile is associated with a lower percentage change.

The smaller number of groups, again, allows a more specific identification of the relationships between quartile changes vis-a'-vis the decile analysis.

Table 5.6 (as does Table 5.5) indicates a predominance of increasing patterns during the years 1983 through 1985. The 12 group subset includes 9 groups (75% of this subset) with increasing patterns of changes in the coefficient of variation (category 1). The remaining 3 (25% of the subset) exhibit decreasing patterns which have been weakened by the exclusion of quartile 4 from the analysis (category 2a).

The early years (1979 through 1982), representing 16 groups, contain only 3 groups (18.8% of this subset) with increasing patterns of change in the coefficient of variation (category 1). The remaining 13 groups (81.2% of the subset) are associated with either decreasing or strongly decreasing patterns of change (categories 2, 2a, or 3). Again, the

TABLE 5.5

DECILE ANALYSIS OF CHANGES IN COEFFICIENT OF VARIATION 1979 - 1985

YEAR	RANKING VARIABLE	OBSERVED VARIABLE ROA3	OBSERVED VARIABLE ROE
1979	ROA3A	3	4
	ROEA	4	3
1980	ROA3A	3	1
	ROEA	1	3
1981	ROA3A	3	1
	ROEA	1	4
1982	ROA3A	3	2
	ROEA	2	3
1983	ROA3A	2	2
	ROEA	2	3
1984	ROA3A	2	2
	ROEA	2	2
1985	ROA3A	2	2
	ROEA	2	2

Note: See the first paragraph of section 5.4.1 for explanation of descriptive categories.

Summary by Observed Variable:

Category	ROA3	ROE
1	2	2
2	7	6
3	4	4
4	1	2
5	-	-

Summary by Ranking Variable:

	Category 1	2	3	4	5
ROA3A	2	7	4	1	-
ROEA	2	6	4	2	-

TABLE 5.6

QUARTILE ANALYSIS OF CHANGES IN COEFFICIENT OF VARIATION 1979 - 1985

YEAR	RANKING VARIABLE	OBSERVED VARIABLE ROA3	OBSERVED VARIABLE ROE
1979	ROA3A	1	2
	ROEA	2	1
1980	ROA3A	2	3
	ROEA	2	1
1981	ROA3A	2	3
	ROEA	3	2
1982	ROA3A	2	2
	ROEA	3	2
1983	ROA3A	2a	2a
	ROEA	2a	1
1984	ROA3A	1	1
	ROEA	1	1
1985	ROA3A	1	1
	ROEA	1	1

Note: See the first paragraph of section 5.4.2 for explanation of descriptive categories.

Summary by Observed Variable:

Category		
1	5	7
2	5	4
2a	2	1
3	2	2

Summary by Ranking Variable:

	Category 1	Category 2	Category 2a	Category 3
ROA3A	5	5	2	2
ROEA	7	4	1	2

results in the early years indicate that variability increases are better compensated than are such increases in the later years. (See Appendix U for all results.)

In the early years of the study, banks with relatively low Period A returns accepted more risk in Period B. This is consistent with the prediction of prospect theory. Further, the acceptance of greater risk by these banks resulted in a favorable outcome, on average, in the early years of the study. In the later years of the study, these banks continued to accept more risk in Period B. The outcome was far less favorable, however. Less risk averse or more risk seeking behavior in Period B is consistently present when poor first half performance is observed, but the quality of the chosen investments appears to deteriorate significantly.

5.5 Inferences Over Time

The results in section 5.3 suggest a definite relationship between decile or quartile value and changes in variance of return from Period A to Period B when observing one year at a time. In this section, this relationship is tested over the seven-year period studied. The null hypotheses (decile and quartile) and the test statistic are described in Chapter 3, section 3.4.2.

In addition to the test of the relationship between F statistic and decile or quartile described above, a test of the relationship between F statistic and year associated with F statistic is conducted. The latter test is motivated by the observations in sections 5.2 and 5.4 that patterns in changes of mean return and coefficient of variation in the early years of the study are not the same as those observed in the later years of the study. The chi-square test is also utilized for this purpose. The expected number of observations per cell of the contingency table depends upon whether the test is being performed on decile statistics or on quartile statistics. For a particular observed variable ranked in a specific way by decile, each year (row) will have 10 observations - one for each decile. If F statistics are independent of the year with which they are associated, the expected number above or below the median for any given year is 5. If the analysis is a quartile analysis, the expected number of observations above or below the median for any given year is 2.

The null hypothesis may take one of two forms. The first form is that no relationship exists between the value of an F statistic and the decile or quartile in which it is observed. In other words, the magnitude of change in variance from Period A to Period B is not a function of whether the group of banks is or is not below target as of June 30. The second form of the null hypothesis is that there is no relationship between the value of an F statistic and the year in which it is observed. In other words, the magnitude of change in variance from Period A to Period B is not a function of the year in which the change is observed. If either form of the null hypothesis is rejected, a pattern of changes in risk would be suggested.

5.5.1 Decile Analysis (Tables 5.7 and 5.8)

Table 5.7 contains the results of the four chi-square tests of ROA3 (ranked by ROA3A and ROEA). Since there is a set of ROA3 deciles statistics (with 10 F statistics) ranked by ROA3A for each year studied, there are 70 F statistics in total involved in the first test. Because there is an even number of F statistics, there is no true median value. The F statistics indicated in the two column headings are those that separate the 35 smaller F statistics from the 35 larger F statistics. The resulting chi-square statistic is indicated. The test results for ranking of ROA3 by ROEA are also shown. The results of the test of a relationship between year and F statistic appear below each set of decile test results along with their respective chi-square statistics.

The critical chi-square values for the decile test (with 9 degrees of freedom) are

α	$\chi^2_{(r-1),(c-1),\alpha}$
0.005	23.5893
0.010	21.6660
0.025	19.0228
0.050	16.9190

The critical chi-square values for the year test (with 6 degrees of freedom) are

α	$\chi^2_{(r-1)(c-1),\,\alpha}$
0.005	18.5476
0.010	16.8119
0.025	14.4494
0.050	12.5916

Referring to the decile chi-square statistics in Table 5.7, the null hypothesis can be rejected at the 1% level of significance. The magnitude of an ROA3 F statistic over time *is* related to the decile in which it appears, and this relationship is statistically significant.

The results with respect to the relationship between year and F statistic are also shown. The null hypothsis again may be rejected. The magnitude of an ROA1 F statistic appears to be related to the year in which it occurs. (All results are shown in Appendix V.)

Table 5.8 contains results of the same test for ROE. The null hypothesis may be rejected in both cases at the 1% level of significance.

For all observed variables in all rankings, F statistics of higher-numbered deciles (excluding decile 10--see section 5.3.1 for a discussion of this exclusion) are more likely to fall above the median F statistic for all deciles. Further, F statistics of lower-numbered deciles are more likely to fall below the median F value. Percentage changes in variance of rate of return are consistently larger for groups

TABLE 5.7

INFERENCES OVER TIME
ROA3 STATISTIC
DECILE ANALYSIS

RANKING VARIABLE

	ROA3A		ROEA	
	F <= 131.0	F >= 131.8	F <= 4.3	F >= 4.4
DECILE				
1	7	-	7	-
2	6	1	5	2
3	3	4	4	3
4	2	5	4	3
5	2	5	4	3
6	1	6	3	4
7	1	6	1	6
8	2	5	-	7
9	4	3	-	7
10	7	-	7	-
χ^2	28.857*		33.428*	
YEAR				
1979	6	4	7	3
1980	10	-	7	3
1981	7	3	8	2
1982	4	6	4	6
1983	3	7	5	5
1984	3	7	2	8
1985	2	8	2	8
χ^2	19.200*		14.400****	

* Significant at 0.5% level
**** Significant at 5.0% level

TABLE 5.8

INFERENCES OVER TIME
ROE STATISTIC
DECILE ANALYSIS

RANKING VARIABLE

	ROA3A		ROEA	
	F <=	F >=	F <=	F >=
	8.6	9.0	201.1	207.8
DECILE				
1	7	-	7	-
2	6	1	5	2
3	4	3	3	4
4	4	3	1	6
5	2	5	3	4
6	3	4	3	4
7	-	7	1	6
8	2	5	3	4
9	-	7	2	5
10	7	-	7	-
X^2	34.571*		24.285*	
YEAR				
1979	8	2	8	2
1980	8	2	8	2
1981	6	4	8	2
1982	4	6	4	6
1983	4	6	2	8
1984	3	7	3	7
1985	2	8	2	8
X^2	13.600****		20.000*	

* Significant at 0.5% level
**** Significant at 5.0% level

of banks whose Period A returns are relatively low.

The evidence with respect to the relationship between F statistic and year ROE is, again, strong with respect to ROA3 and ROE. The null hypothesis may be rejected least at the 5% confidence level. The implication is that F statistics which are greater than the median value appear to be more frequently associated with the later years of the study, while F statistics less than the median value appear to be more frequently associated with the early years.

5.5.2 Quartile Analysis (Table 5.9)

The results of tests of the relationships between quartile value and F statistic are and between year and F statistic are summarized in Table 5.9. As in the decile analysis (section 5.5.2), sixteen tests were conducted. The results of the tests, however, were identical in many cases. In fact, there were only four uniquely different sets of results. These are identified as Patterns A, B, C, and D. The following indicates which tests led to which results.

Pattern	Test Observed Variable	Ranking Variable
A	ROA1	ROA1A
"	ROA2	"
"	ROA3	"
"	ROA1	ROA2A
"	ROA2	"
"	ROA3	"
".	ROA1	ROA3A

A	ROA2	ROA3A
"	ROA3	"
"	ROE	ROEA
B	ROE	ROA1A
"	"	ROA2A
"	"	ROA3A
C	ROA1	ROEA
"	ROA2	"
D	ROA3	"

The critical chi-square values for the quartile test (with 3 degrees of freedom) are

α	$\chi^2_{(r-1)(c-1),\ \alpha}$
0.005	12.8381
0.010	11.3449
0.025	9.3484
0.050	7.8147

The critical chi-square values for the year test are the same as those in section 5.5.1.

Referring to the quartile chi-square statistics in Table 5.13, the null hypothesis can be rejected at the 0.5% level of significance in each case. F statistics for quartiles 2 and 3 are consistently above the median value. F statistics for quartiles 1 and 4 are consistently below the median value. (See section 5.3.2 for a discussion of the relative size of quartile 4 F statistics.) Percentage changes in

TABLE 5.9

INFERENCES OVER TIME
QUARTILE ANALYSIS

	PATTERN							
	A		B		C		D	
	F<= Med. F	F>= Med. F	F<= Med. F	F>= Med. F	F<= Med. F	F>= Med. F	F<= Med. F	F>= Med. F
QUARTILE								
1	7	-	7	-	7	-	7	-
2	-	7	1	6	2	5	1	6
3	-	7	-	7	-	7	-	7
4	7	-	6	1	5	2	6	1
χ^2	28.000*		21.142*		16.571*		21.142*	
YEAR								
1979	2	2	3	1	3	1	2	2
1980	2	2	2	2	3	1	3	1
1981	2	2	2	2	1	3	1	3
1982	2	2	2	2	1	3	2	2
1983	2	2	2	2	2	2	2	2
1984	2	2	2	2	2	2	2	2
1985	2	2	2	2	2	2	2	2
χ^2	0.000		1.000		4.000		2.000	

* Significant at 0.5% level

variance of rate of return are consistently larger for quartiles 2 and 3 vis-a'-vis quartile 1; quartiles 2 and 3 are characterized by lower Period A returns than is quartile 1. The tests of the relationship between year and F statistic all fail to reject the null hypothesis.

The tests of a relationship between year and quartile value suggest no relationship. Tests of a relationship between year and decile value are inconclusive (since ROA1 and ROA2 statistics are not as convincing as ROA3 and ROE statistics--see Appendix V.) Yet the possibility does exist that higher percentage changes in variance from Period A to Period B may be associated with the later years of the study.

There is no such ambiquity with respect to the relationships between F statistic and decile or quartile values. Both decile and quartile tests over time provide strong support for the theory that banks in relatively greater danger of not achieving target rates of return accept (or seek) greater variability of return.

If this is the case, banks with poor first half performance are now accepting or seeking even more variability of return in Period B in order to improve their chances of achieving target returns for the year. This would suggest that more risk has been introduced into the banking system in recent years.

Chapter 6

CONCLUSION

The commercial banking industry in the United States has operated in an ever-changing environment. The most significant environmental changes in the recent past can probably be said to have originated in the 1970s. During this period, interest rates rose dramatically and exhibited considerable volatility. Commercial banks were restricted by Regulation Q of the Federal Reserve in terms of the deposit interest rates that could be offered. Money market mutual funds, virtually nonexistent in 1970, became formidable nonbank competitors. Such funds offered small investors liquidity and market rates of interest. Further, many mutual savings banks successfully sought permission to offer interest-bearing transactions accounts during the late 1970s. Developments such as these threatened low cost sources of funds for commercial banks.

The Depository Institutions Deregulation and Monetary Control Act of 1980 and the Garn-St. Germain Depository Institutions Act of 1982 sought to help commercial banks and other depository institutions to become more competitive. Interest rates were deregulated and investment powers were expanded. Competitive relief was on the way. Indeed, further expansion of powers appears to be inevitable as U.S.

legislators and regulators currently propose repeal of the long-standing Glass-Steagall Act.

At the same time, there are indications that risk in the commercial banking industry has increased significantly. The bank failure rate is now five times the failure rate for the 40 years prior to 1980. Large, brokered deposits appear to have contributed to the increased riskiness of the banking system. Because interest rates are no longer regulated, banks have been able to generate infusions of capital by offering attractive deposit rates. Brokers seek to invest their clients' funds into federally insured commercial bank deposits. If the funds are invested in various commercial banks and each deposit does not exceed $100,000, the total amount invested is 100% insured.

However, it appears that these brokered arrangements have necessitated overly risky, high-yield investments on the part of the commercial banks involved (to realize or earn an acceptable spread). It also appears that such arrangements have been entered into by banks that were already in financial distress. In March 1984, former F.D.I.C. chairman William Isaac testified before Congress. He indicated that of the 90 commercial bank failures in the year or so prior to his testimony, 46 had substantial brokered deposits at the time of failure [15].

Large, international loan portfolios have also contributed to the increased riskiness of the banking indurstry. In the late 1970s, oil-exporting countries enjoyed large balance-of-payments surpluses. A significant amount of these surpluses was invested in U.S. banks. Simultaneously, oil-importing nations experienced what were then thought to be temporary balance-of-payments deficits. Large loans were made to some of these oil-importing countries or to private parties with government guarantees. In addition, Mexico borrowed large amounts of money in anticipation of repaying the loans from funds generated through oil exportation.

At this time, the repayment of many of these loans is questionable. For example, in 1984 Citicorp had a troubled international loan portfolio which amounted to $12.3 billion dollars, representing 213% of shareholders' equity at that time. A complete write-off of these loans would have caused Citicorp to become insolvent. In 1987, a $2 billion addition to loan loss reserves was provided in partial recognition of the dubious quality of such loans.

These factors, as well as others which have not been enumerated here, point to a higher level of risk in the industry. This study was motivated by a need to explain what appears to be a greater tolerance for risk on the part of bank managers. A theoretical framework is needed in which to analyze the decision making process. The need for such a framework is more pressing now than before "deregulation." Previously, interest rate and investment decisions were much more closely supervised and guidelines were predetermined. The increased flexibility now possible makes it absolutely necessary to better understand the decision making process. This improved understanding is mandated in order to ensure the safety and soundness of our financial system.

It is not clear that conventional expected utility theory satisfactorily accomplishes this objective. According to such theory, individuals may be risk averse (possess concave utility functions), risk seeking (convex utility functions), or risk neutral (linear utility functions). The domain of the utility function is terminal or total wealth. Risk is measured by disperson about the mean, or in other words, by variance. The problem is that conventional utility theory makes no provision for changes in risk tolerance or risk preference.

An alternative theory of risky choice behavior is prospect theory. Prospect theory suggests that changes in risk preference may be quite rational and, in fact, predictable. Prospect theory was developed by Kahneman and Tversky and has three fundamental parameters [13,30]. The first is the decision frame, i.e., the set of events, acts, and contingencies that become a part of the decision making process. This decision frame may include consequences of both future acts and past acts.

The second parameter of prospect theory is a goal or aspiration level. All decisions are made in an attempt to reach some sort of target outcome. The third parameter is a value function (the Kahneman and Tversky equivalent of a utility function). The domain of this value function is economic gains (above the target) or economic losses (below the target).

According to prospect theory, risk is a function of the likelihood of not achieving the target or goal. When all alternatives represent economic gains, risk averse behavior (in the conventional variance sense) is predicted. Individuals who are operating in the above-target region will be motivated to preserve this favorable status by accepting (all other things being equal) as little variance as possible. On the other hand, when all alternatives represent economic losses, risk seeking behavior (in the conventional variance sense) is predicted. Individuals who are operating in the below-target region will be motivated to attempt to reach the target. Only alternatives with a nonzero variance offer a way to accomplish this. Variability will be sought, not avoided.

Prospect theory has been tested in laboratory settings by Kahneman and Tversky and by Payne, Laughhunn, and Crum [16,22,23]. When subjects were offered alternatives which represented economic gains, they exhibited risk averse behavior. When they were given alternatives which represented economic losses, the subjects changed risk preferences and became risk seeking. Prospect theory was supported in a convincing manner.

Kahneman and Tversky also noted a study by McGlothlin [18]. The study centered on the behavior of race track parimutuel bettors. McGlothlin observed that bettors appeared to become risk seeking as losses mounted during the day. The eighth (and last) race of the day was characterized by many more bets on "long shots" than the first seven races. Kahneman and Tversky explain this behavior by suggesting that the decision frame of the bettors was the entire set of eight races. Further, they suggest, the target for the bettors was not the _status quo_ at the beginning of the eighth race, but was the _status quo_ at the beginning of the day. In other words, the bettors considered the consequences of the first seven races and their target outcomes when making a decision about the eighth race.

This study of the commercial banking industry also assumes a decision frame that incorporates past as well as future events. A calendar year is assumed to be the entire relevant decision frame. The year is divided into two six-month periods--Period A (January through June) and Period B (July through December). Period A corresponds to McGlothlin's first seven races, while Period B corresponds to the eighth race. The central hypothesis of the study is that banks that are in jeopardy of not reaching their targets as of June 30 will exhibit less risk averse or even risk seeking behavior during Period B vis-a'-vis those banks not in such jeopardy. Seven years (1979 through 1985) are studied.

The identification of a target outcome in this study (or in any study) is a theoretically difficult task. To eliminate the necessity to identify a target, the approximately 14,000 banks are ranked in four ways each year by various rates of return for Period A. Three rates of return on assets (income before securites transactions and extraordinary items, income before extraordinary items, and net income, respectively, as percentages of average assets) and one rate of return on equity (net income as a percentage of average equity) are the variables used to rank the observations.

The assumption is that banks near the top of a ranking (those with higher rates of return) at June 30 have realized rates of return above any reasonable estimate of a target return. Those banks near the bottom of a ranking (those with lower rates of return) at June 30 have realized rates of return below any reasonable estimate of a target return. As an added verification of these positions relative to the target, rankings by cost of funds for Period A are found to be negatively correlated with rankings by any rate of return. Higher ranked banks tend to have lower costs of funds; lower ranked banks tend to have higher costs of funds. These relationships between rate of return and cost of funds provide added assurance that banks with relatively high rates of return at June 30 are in above-target regions and that banks with relatively low rates of return at June 30 are in below-target regions.

Each year's observations are then separated into groups for cross-sectional analysis. The groups formed are first deciles (approximately 1400 observations per decile) and then quartiles (approximately 3500 observations per quartile). The lower numbered groups represent the higher ranking banks. For example, decile 1 contains the 1400 banks with the highest rates of return for the first six months of any given year. Prospect theory predicts that the higher numbered groups (lower ranking banks) will exhibit a larger change in cross-sectional variance from Period A to Period B than the lower numbered groups. The changes in variance are measured by F statistics. All but 1.1% of the more than 1500 F statistics was statistically significant.

If prospect theory is valid, the null hypothesis will be rejected. The null hypothesis is that there is no relationship between the value of the F statistic (a measure of the magnitude of the change in variance) and the decile (or quartile) in which it appears. In other words, over a seven-year period, the 70 F statistics associated with a given variable (10 deciles x 7 years' results in each decile) will be randomly distributed about the median. According to the null hypothesis, each decile should contain, on average, 3.5 F statistics below the median and 3.5 above. The 28 F statistics in each quartile (4 quartiles x 7 years) are analyzed in a similar way.

The null hypothesis is rejected in each case. There is a statistically significant relationship between the value of an F statistic and the decile in which it appears. Below-median F statistics are observed more frequently in lower numbered deciles (higher ranking banks), while above-median F statistics are more frequently associated with higher numbered deciles (lower ranking banks). Similar results are obtained in the quartile analysis.

Prospect theory successfully predicted that banks in danger of not reaching target returns as of June 30 would accept or seek higher variability of return in the second half of the year. Risk preference _is_ a function of the likelihood of not reaching a target return. The strongest evidence is associated with return on equity. In other words, return on equity appears to be the target. Further, there is limited evidence that the larger shifts in variability of return (F statistics) are associated with the later years of the study (1983-85). This suggests that not only are larger increases in variability associated with banks in jeopardy of not reaching target returns, but also that these increases in variability are getting larger over time.

There are several implications of these findings. One implication is that theoretical decision making models incorporating universal risk aversion are incomplete. A more complete description of risky choice behavior will include risk seeking behavior for below-target outcomes.

Another implication is that the outcomes of past decisions or acts can have a significant impact on prospective decisions. The decision frame can, indeed, include past events as well as future events. Since such past events can frequently be observed by individuals other than the decision maker, the observation of these past events can facilitate a more accurate prediction by any interested party of the risky choice behavior of the decision maker.

A third implication of the study is that the target rate of return appears to be return on equity. The strongest evidence supporting prospect theory is associated with return on equity.

A fourth implication of the findings is that the perceived shift in risk tolerance in the commercial banking industry is real. Over the years studied, the changes in variability of return from the first six months of the year to the second six months increase. Deregulation and other market conditions have presented challenges as well as opportunities.

There also policy implications. A better understanding of risky choice behavior should enable regulators to enhance their oversight function. If a bank is in jeopardy of not realizing a target rate of return, it is far more likely to increase the inherent risk of its asset and/or liability configuration. Perhaps such banks should be more closely monitored than banks operating in above-target regions.

A further, and perhaps more profound, policy implication involves the ability of bank managers to operate successfully in an environment of deregulation, and to maintain collectively the safety and soundness of the system as a whole. Competitive success involves attaining certain goals. In this study it has been found that efforts to achieve target returns can result in less risk averse or even risk seeking behavior. How much is the safety of the system compromised by this rational shift in risk preference? Given that this behavior can be predicted, should the "deregulation" emphasis become a "reregulation" emphasis? I think not.

The system can be protected without resorting to reregulation. This is not to say that no action is required. There should be implementation of advanced techniques to manage the interest rate risk to which bank portfolios are now more exposed. At a minimum, each bank manager should be thoroughly acquainted with interest rate sensitivities, gap management, and duration analysis. Individual banks have been encouraged by regulators to master the theory associated with these topics.

However, understanding only these topics is not likely to be sufficient to adequately manage a bank portfolio. Bank management cannot be a passive occupation. Management should also be knowledgeable of methods that can be used to protect the institution from excessive interest rate risk exposure. Portfolio hedging and other protective techniques are used, primarily, by larger banking organizations. While it is true that such management tools are not appropriate for every bank, it is also true that no bank manager should be unaware of their existence and their proper application.

Admittedly, bank management is frequently under considerable pressure to keep the transactional operations of the bank flowing smoothly. As a result, it may appear that the assessment of interest rate sensitivity and other critical characteristics of the organization is a time-consuming luxury. Nonetheless, the latter issues somehow must be addressed.

Commercial bank managers function in an environment that contains opportunities for aggressive asset and liability management. There are also significant elements of risk in this environment. Clearly, the risk must be successfully managed in order to take advantage of the opportunities. The findings of this study contribute to a more complete understanding of the nature of this risk.

APPENDIX A
DECILE SUMMARIES--1979

TABLE A.1
1979 RANKED BY ROA1A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6567	1.6937	3.7818	2.6937
2	-0.3548	63.5000	11.5067	64.5000
3	-0.2277	153.2727	14.7746	154.2727
4	-0.1463	131.5714	12.9855	132.5714
5	-0.0657	149.2000	12.3986	150.2000
6	-0.0066	171.5000	12.9828	172.5000
7	0.0412	293.7500	15.4562	294.7500
8	0.1301	161.0000	10.7290	162.0000
9	0.3148	104.3076	6.8614	105.3076
10	-7.4381	1.7409	-1.2567	2.7409
		ROA2 STATISTICS		
1	-0.6873	1.5990	4.1574	2.5990
2	-0.3859	38.4117	9.1801	39.4117
3	-0.2559	67.6800	10.1650	66.6800
4	-0.1711	39.8260	6.7838	40.8260
5	-0.0851	26.8571	4.8160	27.8571
6	-0.0333	53.3076	6.6349	54.3076
7	0.0227	73.2500	7.5517	74.2500
8	0.1153	52.6666	5.4848	53.6666
9	0.2949	44.4193	4.2285	45.4193
10	-6.4438	1.6882	-1.3012	2.6882
		ROA3 STATISTICS		
1	-0.6848	1.5463	4.0636	2.5463
2	-0.3867	38.9807	9.3582	39.9807
3	-0.2542	62.5555	9.6075	63.5555
4	-0.1705	37.8400	6.4474	38.8400
5	-0.0870	13.0000	3.0930	14.0000
6	-0.0274	20.0294	3.7237	21.0294
7	0.0229	65.4444	6.9885	66.4444
8	0.1140	36.2307	4.5000	37.2307
9	0.2928	35.3589	3.6882	36.3589
10	-6.7466	1.7228	-1.2871	2.7228
		ROE STATISTICS		
1	-0.7216	0.4876	3.3814	1.4876
2	-0.4195	0.8841	1.3646	1.8841
3	-0.2928	6.7796	2.9441	7.7796
4	-0.1930	3.7430	1.6988	4.7430
5	-0.1123	2.6697	1.1580	3.6697
6	-0.0509	2.5099	0.9740	3.5099
7	-0.0090	8.7781	2.1556	9.7781
8	0.0690	2.7785	0.8184	3.7785
9	0.2414	10.0395	1.6763	11.0395
10	-12.5563	1.9392	-1.1483	2.939

TABLE A.2
1979 RANKED BY ROA2A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6569	1.6039	3.7045	2.6039
2	-0.3619	46.4000	9.8423	47.4000
3	-0.2271	61.5833	9.1889	62.5833
4	-0.1382	58.3125	8.0035	59.3125
5	-0.0703	45.5333	6.3333	46.5333
6	-0.0082	50.0000	6.2176	51.0000
7	0.0359	79.3571	7.7577	80.3571
8	0.1473	45.8000	4.9782	46.8000
9	0.3167	49.0370	4.3976	50.0370
10	-8.5543	1.7290	-1.2186	2.7290
		ROA2 STATISTICS		
1	-0.6894	1.6335	4.2252	2.6335
2	-0.3947	72.8666	13.1981	73.8666
3	-0.2564	137.0000	14.4946	138.0000
4	-0.1653	159.8333	13.6188	160.8333
5	-0.0930	141.4000	12.4875	142.4000
6	-0.0317	195.2000	14.1563	196.5000
7	0.0183	284.5000	15.7712	285.5000
8	0.1317	153.6666	10.2269	154.6666
9	0.3003	98.4285	6.7934	99.4285
10	-6.0169	1.7614	-1.3312	2.7614
		ROA3 STATISTICS		
1	-0.6869	1.5778	4.1288	2.5578
2	-0.3951	72.7419	13.1484	73.7419
3	-0.2548	107.2142	12.8766	108.2142
4	-0.1660	121.3750	12.0324	122.3750
5	-0.0952	19.6571	4.0552	20.6571
6	-0.0257	29.3703	4.6242	30.3703
7	0.0187	189.8333	12.2897	190.8333
8	0.1321	71.0769	6.5798	72.0769
9	0.2933	54.7200	4.8183	55.7200
10	-6.2199	1.0802	-1.3210	2.8082
		ROE STATISTICS		
1	-0.7232	0.4953	3.4179	1.4953
2	-0.4305	1.2569	1.6383	2.2569
3	-0.2913	5.9404	2.7177	6.9404
4	-0.1869	3.5867	1.6339	4.5867
5	-0.1213	3.1101	1.3074	4.1101
6	-0.0492	3.0809	1.1247	4.0809
7	-0.0143	8.7845	2.1729	9.7845
8	0.0872	2.8555	0.8059	3.8555
9	0.2404	10.1342	1.6899	11.1342
10	-10.1501	2.0424	-1.1906	3.0422

TABLE A.3
1979 RANKED BY ROA3A

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6551	1.5216	3.6039	2.5216
2	-0.3602	43.1875	9.3578	44.1875
3	-0.2265	50.1000	8.2603	51.1000
4	-0.1410	44.1904	6.8514	45.1904
5	-0.0657	34.4444	5.4109	35.4444
6	-0.0114	44.6666	5.7962	45.6666
7	0.0353	74.4666	7.3383	75.4666
8	0.1391	27.3030	3.6957	28.3030
9	0.3097	43.7000	4.1028	44.7000
10	-8.7860	1.7231	-1.2119	2.7231
		ROA2 STATISTICS		
1	-0.6877	1.5487	4.1145	2.5487
2	-0.3925	63.7252	12.1797	64.7352
3	-0.2564	90.0000	11.8010	91.0000
4	-0.1686	79.3333	9.7433	80.3333
5	-0.0881	92.2857	9.2499	93.2857
6	-0.0342	118.8571	10.4605	119.8571
7	0.0179	229.2000	13.9593	230.2000
8	0.1222	48.0526	5.3049	49.0526
9	0.2976	90.9333	6.4079	91.9333
10	-6.1736	1.7467	-1.3203	2.7467
		ROA3 STATISTICS		
1	-0.6881	1.6322	4.2019	2.6322
2	-0.3932	74.7666	13.4077	75.7666
3	-0.2558	128.0000	14.5826	129.0000
4	-0.1679	163.0000	13.8415	164.0000
5	-0.0885	130.0000	11.7512	131.0000
6	-0.0332	209.0000	14.6099	210.0000
7	0.0192	288.0000	15.9229	289.0000
8	0.1293	158.3333	10.4340	159.3333
9	0.2994	97.4285	6.7389	98.4285
10	-6.0503	1.8137	-1.3321	2.8137
		ROE STATISTICS		
1	-0.7233	0.5188	3.4548	1.5188
2	-0.4288	1.2196	1.6083	2.2196
3	-0.2924	6.4877	2.8671	7.4877
4	-0.1900	3.3565	1.5768	4.3565
5	-0.1155	2.8031	1.2049	3.8031
6	-0.0582	4.9895	1.4598	5.9895
7	-0.0140	9.3063	2.2560	10.3063
8	0.0861	3.2751	0.9036	4.2751
9	0.2457	11.5015	1.8383	12.5015
10	-9.4254	2.0418	-1.2070	3.0418

TABLE A.4
1979 RANKED BY ROEA
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6867	0.7553	3.2293	1.7553
2	-0.3662	1.6720	1.5809	2.6720
3	-0.2570	1.6050	1.1729	2.6050
4	-0.1708	2.0030	1.0893	3.0030
5	-0.0903	1.8504	0.8562	2.8504
6	-0.0507	1.5088	0.6680	2.5088
7	0.0156	5.4633	1.5022	6.4633
8	0.1414	4.3789	1.0334	5.3789
9	0.3113	8.8888	1.3986	9.8888
10	-21.2639	1.5798	-1.0792	2.5798
		ROA2 STATISTICS		
1	-0.7177	0.7645	3.7060	1.7645
2	-0.3981	1.7938	1.7785	2.7938
3	-0.2884	1.6785	1.3009	2.6785
4	-0.1989	2.0492	1.1801	3.0492
5	-0.1146	2.0310	0.9662	3.0310
6	-0.0794	1.5854	0.7466	2.5854
7	-0.0059	5.5529	1.5771	6.5529
8	0.1278	4.7500	1.1258	5.7500
9	-.3071	9.5729	1.4846	10.5729
10	-10.3422	1.6124	-1.1730	2.6124
		ROA3 STATISTICS		
1	-0.7172	0.8220	3.7738	1.8220
2	-0.3993	1.8586	1.8159	2.8586
3	-0.2871	1.6995	1.3044	2.6995
4	-0.1971	2.0493	1.1756	3.0493
5	-0.1161	2.0622	0.9798	3.0622
6	-0.0779	1.6507	0.7655	2.6507
7	-0.0062	5.9436	1.6512	6.9436
8	0.1337	5.1356	1.1856	6.1356
9	0.3102	9.8839	1.5145	10.8839
10	-9.8533	1.6721	-1.1846	2.6721
		ROE STATISTICS		
1	-0.7066	2.4829	5.3626	3.4829
2	-0.3906	64.4964	12.2811	65.4964
3	-0.2818	137.5245	15.3846	138.5245
4	-0.1930	206.8322	16.8585	207.8322
5	-0.1105	200.1284	14.9427	201.1284
6	-0.0728	194.6819	14.0902	195.6819
7	-0.0105	430.6566	20.0006	431.6566
8	0.1354	156.6011	10.0570	157.6011
9	0.3142	116.4088	7.2443	117.4088
10	-6.2800	1.8236	-1.3182	2.8236

APPENDIX B
DECILE SUMMARIES--1980

TABLE B.1
1980 RANKED BY ROA1A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.7553	1.7157	5.7356	2.7157
2	-0.3996	38.1272	9.3779	39.1272
3	-0.2401	76.1904	10.4528	77.1904
4	-0.1517	247.0000	17.5332	248.0000
5	-0.0417	124.1428	10.7098	125.1428
6	0.0254	128.6666	10.1747	129.6666
7	0.0983	276.6000	13.7442	277.6000
8	0.2460	110.6250	7.6692	111.6250
9	0.4511	137.8571	7.1125	138.8571
10	-4.4546	2.0274	-1.5036	3.0274
		ROA2 STATISTICS		
1	-0.7943	1.6296	6.8869	2.6296
2	-0.4443	19.3271	7.1239	20.3271
3	-0.2778	21.4459	5.5501	22.4459
4	-0.1805	49.5510	7.7155	50.5510
5	-0.0753	24.7941	4.4698	25.7941
6	-0.0023	19.8947	3.6074	20.8947
7	0.0585	26.0377	3.9269	27.0377
8	0.2137	19.4042	2.7396	20.4042
9	0.3931	32.3050	3.1472	33.3050
10	-4.7566	1.8608	-1.4502	2.8608
		ROA3 STATISTICS		
1	-0.7935	1.6021	6.8133	2.6021
2	-0.4433	19.0462	7.0481	20.0462
3	-0.2759	19.7125	5.3000	20.7125
4	-0.1807	42.6140	7.0726	43.6140
5	-0.0716	23.0810	4.3126	24.0810
6	-0.0040	15.1000	3.0303	16.1000
7	0.0635	16.2142	2.9086	17.2142
8	0.2163	19.0208	2.6850	20.0208
9	0.3865	28.3134	2.9079	29.3134
10	-4.8015	1.7399	-1.4354	2.7399
		ROE STATISTICS		
1	-0.8231	0.5775	6.4128	1.5775
2	-0.4704	1.8520	2.1890	2.8520
3	-0.2966	2.6744	1.7255	3.6744
4	-0.2019	5.9550	2.3044	6.9550
5	-0.0878	3.0246	1.1994	4.0246
6	-0.0246	3.0913	1.0737	4.0913
7	0.0324	8.4248	1.9735	9.4248
8	0.1826	5.1771	1.1015	6.1771
9	0.3226	26.4338	2.9600	27.4338
10	-5.3803	1.9246	-1.3904	2.924

TABLE B.2
1980 RANKED BY ROA2A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
ROA1 STATISTICS				
1	-0.7579	1.6384	5.7101	2.6384
2	-0.3975	19.9142	6.5734	20.9142
3	-0.2487	26.7368	5.9838	27.7368
4	-0.1479	32.3783	5.7876	33.3783
5	-0.0472	32.7777	5.0900	33.7777
6	0.0275	32.7142	4.6609	33.7142
7	0.1052	29.7857	4.0213	30.7857
8	0.2435	16.3773	2.3373	17.3773
9	0.4389	41.3777	3.5104	42.3777
10	-5.4416	1.9002	-1.3834	2.9002
ROA2 STATISTICS				
1	-0.7992	1.6612	7.0456	2.6612
2	-0.4482	39.5090	10.1792	40.5090
3	-0.2942	72.0909	9.8866	73.0909
4	-0.1808	244.8000	13.2295	245.8000
5	-0.0809	129.0000	10.4265	130.0000
6	-0.0058	159.3333	7.5338	160.3333
7	0.0692	262.4000	4.6480	263.4000
8	0.1978	138.7142	6.9475	139.7142
9	0.4294	130.0666	5.8617	131.0666
10	-4.2401	1.9871	-1.5193	2.9871
ROA3 STATISTICS				
1	-0.7983	1.6332	7.0456	2.6332
2	-0.4465	37.2586	10.1792	38.2586
3	-0.2926	58.3333	9.8866	59.3333
4	-0.1813	136.0000	13.2295	137.0000
5	-0.0773	114.7500	10.4265	115.7500
6	-0.0065	73.6153	7.5338	74.6153
7	0.0733	35.9722	4.6480	36.9722
8	0.1974	88.0000	6.9475	89.0000
9	0.4246	92.5714	5.8617	93.5714
10	-4.2567	1.8600	-1.5193	2.8600
ROE STATISTICS				
1	-0.8277	0.5673	6.2675	1.5673
2	-0.4751	2.0315	2.3175	3.0315
3	-0.3113	2.9938	1.9018	3.9938
4	-0.2019	7.1469	2.5767	8.1469
5	-0.0954	3.6057	1.3726	4.6057
6	-0.0305	5.2217	1.5731	6.2217
7	0.0401	10.5212	2.2632	11.5212
8	0.1608	7.1102	1.4532	8.1102
9	0.3596	43.1171	3.8850	44.1171
10	-4.5799	2.0189	-1.4853	3.0189

TABLE B.3
1980 RANKED BY ROA3A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.7577	1.6104	5.6707	2.6104
2	-0.3965	18.8378	6.3908	19.8378
3	-0.2519	23.6307	5.6418	24.6307
4	-0.1485	31.4342	5.6697	32.4342
5	-0.0409	28.0322	4.6347	29.0322
6	0.0293	26.7352	4.1310	27.7352
7	0.1014	28.7906	3.9661	29.7906
8	0.2400	15.0172	2.2306	16.0172
9	0.4286	39.7021	3.4824	40.7021
10	-5.5665	1.8949	-1.3725	2.8949
		ROA2 STATISTICS		
1	-0.7990	1.6386	7.0859	2.6386
2	-0.4478	34.4285	9.7846	35.4285
3	-0.2955	57.1071	9.8190	58.1071
4	-0.1823	187.7692	15.9739	188.7692
5	-0.0752	80.9090	8.8461	81.9090
6	-0.0040	105.6666	9.3569	106.6666
7	0.0628	185.1428	12.1721	186.1428
8	0.1967	81.6666	6.7026	82.6666
9	0.4200	122.0000	6.8304	123.0000
10	-4.3187	1.9803	-1.5202	2.9803
		ROA3 STATISTICS		
1	-0.7981	0.5672	7.0560	1.5672
2	-0.4481	2.0762	10.5982	3.0762
3	-0.2942	3.1145	11.2184	4.1145
4	-0.1818	7.4977	18.1214	8.4977
5	-0.0739	3.5762	11.7548	4.5762
6	-0.0060	5.3772	11.8473	6.3772
7	0.0664	12.8473	13.4047	13.8473
8	0.1971	7.6209	9.0354	8.6209
9	0.4226	48.9418	7.1524	49.9418
10	-4.2344	2.0304	-1.5232	3.0304
		ROE STATISTICS		
1	-0.8274	1.6450	6.2569	2.6450
2	-0.4765	40.2962	2.3509	41.2962
3	-0.3137	73.1363	1.9557	74.1363
4	-0.2017	244.2000	2.6518	245.2000
5	-0.0924	130.1428	1.3570	131.1428
6	-0.0307	157.5000	1.6055	158.5000
7	0.0373	215.5000	2.5871	216.5000
8	0.1596	141.4285	1.5320	142.4285
9	0.3591	130.0666	4.1994	131.0666
10	-4.5319	1.8646	-1.4928	2.8646

TABLE B.4
1980 RANKED BY ROEA
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.7744	0.6166	4.6365	1.6166
2	-0.3913	1.4058	1.5479	2.4058
3	-0.2600	1.6454	1.1984	2.6454
4	-0.1685	1.4039	0.8648	2.4039
5	-0.0758	2.0722	0.8957	3.0722
6	-0.0143	1.5310	0.6146	2.5310
7	0.0338	8.5320	1.9839	9.5320
8	0.2217	3.9921	0.8296	4.9921
9	0.3819	7.8750	1.1552	8.8750
10	-7.5777	1.7458	-1.2534	2.7458
		ROA2 STATISTICS		
1	-0.8160	0.6905	7.6211	1.6905
2	-0.4372	1.4840	1.8009	2.4840
3	-0.2984	1.7855	1.3781	2.7855
4	-0.2165	1.6793	1.0884	2.6793
5	-0.1142	2.2704	1.0402	3.2704
6	-0.0389	1.9738	0.7941	2.9738
7	-0.0012	9.1760	2.1910	10.1760
8	0.1801	4.3640	0.9640	5.3640
9	0.3686	9.8464	1.4054	10.8464
10	-5.6116	1.8340	-1.3650	2.8340
		ROA3 STATISTICS		
1	-0.8143	0.7230	6.0705	1.7230
2	-0.4365	1.5230	1.8182	2.5230
3	-0.2976	1.8455	1.4007	2.8455
4	-0.2176	1.7088	1.1046	2.7088
5	-0.1143	2.2389	1.0320	3.2389
6	-0.0383	1.9736	0.7937	2.9736
7	0.0002	9.4897	2.2364	10.4897
8	0.1834	4.3552	0.9561	5.3552
9	0.3746	9.7933	1.3901	10.7933
10	-5.4488	1.7279	-1.3712	2.7279
		ROE STATISTICS		
1	-0.8014	2.3090	8.1599	3.3090
2	-0.4232	46.7743	10.9849	47.7743
3	-0.2855	104.5964	13.3828	105.5964
4	-0.1986	156.3857	14.6585	157.3857
5	-0.1067	182.7902	14.1740	183.7602
6	-0.0271	174.8299	12.6280	175.8299
7	0.0107	509.6224	21.3611	510.6224
8	0.2002	155.9577	9.4369	156.9577
9	0.4148	295.4343	11.1694	296.4343
10	-3.7835	1.9758	-1.6197	2.9758

APPENDIX C
DECILE SUMMARIES--1981

TABLE C.1
1981 RANKED BY ROA1A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.7721	2.0070	6.6094	3.0070
2	-0.4683	42.2465	11.3475	43.2465
3	-0.3368	92.3478	13.6960	93.3478
4	-0.2423	94.8461	11.9504	95.8461
5	-0.2096	451.7777	26.1990	452.7777
6	-0.1366	99.5000	10.7248	100.5000
7	-0.1010	180.1428	13.9206	181.1428
8	-0.0228	130.6250	10.8307	131.6250
9	0.0861	86.8888	7.6465	87.8888
10	-2.9722	2.5462	-1.9547	3.5462
		ROA2 STATISTICS		
1	-0.8201	1.9326	8.5211	2.9326
2	-0.5169	13.1822	6.8029	14.1822
3	-0.3839	29.8648	8.0140	30.8648
4	-0.2840	20.4000	5.4751	21.4000
5	-0.2522	63.5909	9.7874	64.5909
6	-0.1721	17.6250	4.1963	18.6250
7	-0.1387	26.1960	5.0452	27.1960
8	-0.0735	19.5344	3.9082	20.5344
9	0.0553	33.0784	4.5521	34.0784
10	-2.3607	2.3312	-2.3412	3.3312
		ROA3 STATISTICS		
1	-0.8170	1.9546	8.3935	2.9546
2	-0.5178	12.0472	6.4973	13.0472
3	-0.3844	25.5930	7.4010	26.5930
4	-0.2828	17.7391	5.0137	18.7391
5	-0.2491	60.8840	9.4437	61.8840
6	-0.1763	11.9154	3.3630	12.9154
7	-0.1400	23.1379	4.7146	24.1379
8	-0.0682	18.1612	3.7005	19.1612
9	0.0499	23.6478	3.7395	24.6478
10	-2.4391	2.3236	-2.2667	3.3236
		ROE STATISTICS		
1	-0.8491	1.0024	8.3834	2.0024
2	-0.5365	3.1205	3.3797	4.1205
3	-0.3948	4.1198	2.7390	5.1198
4	-0.2916	2.6639	1.7023	3.6639
5	-0.2621	11.0770	3.7101	12.0770
6	-0.1860	3.1843	1.5130	4.1843
7	-0.1519	6.4164	2.2113	7.4164
8	-0.0843	6.9253	2.0744	7.9253
9	0.0154	11.0909	2.4241	12.0909
10	-2.3306	0.2658	-1.8455	1.2658
	(-1.8364)	(4.4229)	(-3.7841)	(5.4229)

TABLE C.2
1981 RANKED BY ROA2A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.7750	1.9637	6.6541	2.9637
2	-0.4661	29.3725	9.3389	30.3725
3	-0.3404	51.3902	9.9800	52.3902
4	-0.2414	38.0937	7.2165	39.0937
5	-0.2097	158.3846	14.8284	159.3846
6	-0.1404	29.0714	5.3367	30.0714
7	-0.0936	32.3055	5.4001	33.3055
8	-0.0275	27.8918	4.5201	28.8918
9	0.0856	27.2463	3.9103	28.2463
10	-4.2402	2.2101	-1.5529	3.2101
		ROA2 STATISTICS		
1	-0.8233	2.0884	8.9491	3.0884
2	-0.5211	43.1081	12.8784	44.1081
3	-0.3906	94.7083	15.2153	95.7083
4	-0.2846	96.6923	12.6436	97.6923
5	-0.2573	477.6666	28.4403	478.6666
6	-0.1807	119.3750	12.1671	120.3750
7	-0.1291	182.4285	14.5876	183.4285
8	-0.0791	145.2500	11.7454	146.2500
9	0.0723	111.8947	9.0292	112.8947
10	-2.2169	2.2866	-2.4897	3.2866
		ROA3 STATISTICS		
1	-0.8201	2.1079	8.8053	3.1079
2	-0.5224	33.3617	11.2445	34.3617
3	-0.3905	78.3793	13.5536	79.3793
4	-0.2836	54.4782	9.4536	55.4782
5	-0.2539	307.2142	22.6362	308.2142
6	-0.1847	30.9677	5.8805	31.9677
7	-0.1283	97.5384	10.2906	98.5384
8	-0.0771	89.6923	9.3707	90.6923
9	0.0649	53.0500	5.9297	54.0500
10	-2.2759	2.2796	-2.4192	3.2796
		ROE STATISTICS		
1	-0.8530	1.0848	8.8276	2.0848
2	-0.5417	3.5141	3.6360	4.5141
3	-0.4013	4.5100	2.9212	5.5100
4	-0.2926	3.3113	1.9352	4.3113
5	-0.2685	13.4699	4.2004	14.4699
6	-0.1949	4.3100	1.8625	5.3100
7	-0.1396	8.5671	2.5952	9.5671
8	-0.0899	10.1995	2.6771	11.1995
9	-0.0015	29.1135	4.4958	30.1135
10	-2.1806	0.1525	-1.9093	1.1525
	(-1.8400)	(4.0014)	(-3.6620)	(5.0014)

TABLE C.3
1981 RANKED BY ROA3A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.7743	1.9237	6.5792	2.9237
2	-0.4665	25.0341	8.5617	26.0341
3	-0.3377	41.6862	8.8589	42.6862
4	-0.2420	32.5405	6.6648	33.5405
5	-0.2114	136.5666	13.8948	137.5666
6	-0.1483	27.1875	5.2011	28.1875
7	-0.0948	31.2702	5.2621	32.2702
8	-0.0265	27.8108	4.5001	28.8108
9	0.0837	27.4285	3.9068	28.4285
10	-4.4192	2.1651	-1.5202	3.1651
		ROA2 STATISTICS		
1	-0.8232	2.0493	8.8772	3.0493
2	-0.5208	34.6222	11.4873	35.6222
3	-0.3877	71.7500	12.8577	72.7500
4	-0.2857	64.8421	10.4913	65.8421
5	-0.2590	329.1538	23.2889	330.1538
6	-0.1880	78.0000	10.1307	79.0000
7	-0.1310	157.7500	13.1231	158.7500
8	-0.0785	129.3333	11.2051	130.3333
9	0.0704	108.4000	8.8493	109.4000
10	-2.2681	2.2384	-2.4190	3.2384
		ROA3 STATISTICS		
1	-0.8222	2.1572	8.9976	3.1572
2	-0.5205	42.5540	12.7910	43.5540
3	-0.3884	96.2083	15.2448	97.2083
4	-0.2847	95.6923	12.5343	96.6923
5	-0.2563	477.0000	28.4577	478.0000
6	-0.1886	130.7500	12.8454	131.7500
7	-0.1300	180.1428	14.5703	181.1428
8	-0.0734	129.2222	11.6657	130.2222
9	0.0710	114.4736	9.1287	115.4736
10	-2.3065	2.2717	-2.3843	3.2717
		ROE STATISTICS		
1	-0.8544	1.0514	8.8408	2.0514
2	-0.5417	4.0445	3.9011	5.0445
3	-0.3994	4.4844	2.8994	5.4844
4	-0.2937	3.2791	1.9291	4.2791
5	-0.2711	13.6325	4.2482	14.6325
6	-0.1991	6.1602	2.3411	7.1602
7	-0.1425	8.0214	2.5029	9.0214
8	-0.0875	10.6887	2.7471	11.6887
9	0.0064	40.6704	5.4143	41.6704
10	-2.2344	0.1493	-1.8684	1.1493
	(-1.8830)	(4.0009)	(-3.5325)	(5.0009)

TABLE C.4
1981 RANKED BY ROEA
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.7840	0.7945	5.2018	1.7945
2	-0.4936	1.8231	2.3181	2.8231
3	-0.3325	1.7117	1.4674	2.7117
4	-0.2889	2.7189	1.7124	3.7189
5	-0.2220	1.6391	1.0875	2.6391
6	-0.1568	1.9378	1.0325	2.9378
7	-0.1091	2.1005	0.9770	3.1005
8	-0.0752	2.6107	1.0545	3.6107
9	0.0709	17.8725	3.0529	18.8725
10	-7.6839	2.1791	-1.2667	3.1791
		ROA2 STATISTICS		
1	-0.8319	0.8580	7.1088	1.8580
2	-0.5485	2.1463	2.9294	3.1463
3	-0.3823	1.9406	1.7765	2.9406
4	-0.3352	2.7528	1.9142	3.7528
5	-0.2661	1.7928	1.2780	2.7928
6	-0.2021	2.0613	1.1925	3.0613
7	-0.1521	2.5494	1.2225	3.5494
8	-0.1163	3.3636	1.3622	4.3636
9	0.0400	21.4557	3.5553	22.4557
10	-2.6957	2.2661	-2.0657	3.2661
		ROA3 STATISTICS		
1	-0.8304	0.9324	7.1992	1.9324
2	-0.5487	2.1816	2.9528	3.1816
3	-0.3817	1.9542	1.7812	2.9542
4	-0.3369	2.7536	1.9208	3.7536
5	-0.2644	1.7651	1.2608	2.7651
6	-0.2030	2.0769	1.2006	3.0769
7	-0.1482	2.5706	1.2184	3.5706
8	-0.1150	3.3750	1.3619	4.3750
9	0.0456	21.4052	3.5288	22.4052
10	-2.7375	2.2980	-2.0451	3.2980
		ROE STATISTICS		
1	-0.8187	-0.5097	2.8628	0.4902
	(-0.8154)	(3.3967)	(10.3594)	(4.3967)
2	-0.5360	89.4659	19.5042	90.4659
3	-0.3628	103.5797	15.0495	104.5797
4	-0.3312	211.2509	20.7873	212.2509
5	-0.2537	163.5721	16.1883	164.5721
6	-0.1880	177.8543	15.4777	178.8543
7	-0.1352	172.1406	14.2133	173.1406
8	-0.0950	152.6228	12.6987	153.6228
9	0.0504	246.9625	13.9908	247.9625
10	-1.7265	4.0720	-4.0996	5.0720

APPENDIX D
DECILE SUMMARIES--1982

TABLE D.1
1982 RANKED BY ROA1A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
ROA1 STATISTICS				
1	-0.8334	1.4678	8.4353	2.4678
2	-0.4622	61.4117	13.7265	62.4117
3	-0.3466	128.9473	16.3856	129.9473
4	-0.3095	258.9000	22.9474	259.9000
5	-0.2369	273.5000	20.4222	274.5000
6	-0.2101	298.2857	21.5208	299.2857
7	-0.1327	252.0000	17.4481	253.0000
8	-0.0966	244.1111	16.0612	245.1111
9	-0.0474	121.3200	10.6080	122.3200
10	-0.6180	2.1931	3.6782	3.1931
ROA2 STATISTICS				
1	-0.8435	1.4113	8.9236	2.4113
2	-0.4710	16.1071	6.8271	17.1071
3	-0.3497	30.0987	7.5834	31.0987
4	-0.3061	38.2083	8.0388	39.2083
5	-0.2055	33.6500	6.4143	34.6500
6	-0.1930	36.2000	6.5409	37.2000
7	-0.0968	21.0694	4.1892	22.0694
8	-0.0464	60.7699	7.2425	61.7699
9	0.1241	27.1100	3.7186	28.1100
10	-0.8076	2.2103	8.3146	3.2103
ROA3 STATISTICS				
1	-0.8410	1.3900	8.7286	2.3900
2	-0.4725	14.6744	6.5091	15.6744
3	-0.3482	28.0000	7.2842	29.0000
4	-0.3069	35.8815	7.7490	36.8815
5	-0.2004	32.2063	6.2036	33.2063
6	-0.1906	35.0161	6.3864	36.0161
7	-0.0987	19.8961	4.0603	20.8961
8	-0.0480	57.6829	7.0555	58.6829
9	0.1037	17.5297	2.9041	18.5297
10	-0.8542	1.8929	10.6682	2.8929
ROE STATISTICS				
1	-0.8631	1.1120	9.6168	2.1120
2	-0.4948	5.8929	4.1969	6.8929
3	-0.3591	6.0035	3.1295	7.0035
4	-0.3174	7.3414	3.2316	8.3414
5	-0.2176	8.9351	3.0287	9.9351
6	-0.2018	11.7850	3.4800	12.7850
7	-0.1134	6.2937	2.0461	7.2937
8	-0.0629	18.0668	3.6595	19.0668
9	0.0421	14.5034	2.7782	15.5034
10	-0.3883	2.9772	2.2604	3.9772

TABLE D.2
1982 RANKED BY ROA2A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.8363	1.4496	8.5615	2.4496
2	-0.4630	35.9156	10.3441	36.9156
3	-0.3689	95.0882	14.4725	96.0882
4	-0.2885	81.6400	11.7780	82.6400
5	-0.2396	62.2258	9.4272	63.2258
6	-0.2129	68.3666	9.5084	69.3666
7	-0.1334	52.8666	7.4955	53.8666
8	-0.1035	48.3902	6.8323	49.3902
9	-0.0144	44.7260	5.8630	45.7260
10	-0.6578	2.0624	4.1150	3.0624
		ROA2 STATISTICS		
1	-0.8504	1.4798	9.5321	2.4798
2	-0.4784	64.5400	14.4609	65.5400
3	-0.3763	178.1578	20.2425	179.1578
4	-0.2818	192.6000	18.3577	193.6000
5	-0.2089	242.3750	18.1975	243.3750
6	-0.2015	314.4285	21.1791	315.4285
7	-0.1067	278.8333	17.2583	279.8333
8	-0.0595	220.0000	15.1432	221.0000
9	0.1651	122.4074	8.4752	123.4074
10	-0.8834	2.2930	14.5737	3.2930
		ROA3 STATISTICS		
1	-0.8480	1.4575	9.3141	2.4575
2	-0.4790	47.2608	12.3057	48.2608
3	-0.3757	130.0000	17.3125	131.0000
4	-0.2817	126.6000	14.7944	127.6000
5	-0.2052	162.1666	15.4017	163.1666
6	-0.1993	244.5555	18.1119	245.5555
7	-0.1071	152.7272	12.8948	153.7272
8	-0.0612	169.3846	12.7297	170.3846
9	0.1456	38.2790	4.4800	39.2790
10	-0.9265	1.9648	22.4492	2.9648
		ROE STATISTICS		
1	-0.8707	1.1558	10.3576	2.1558
2	-0.5030	6.9551	4.6753	7.9551
3	-0.3881	9.2925	4.2434	10.2925
4	-0.2920	5.8525	2.6975	6.8525
5	-0.2221	10.2707	3.3159	11.2707
6	-0.2139	15.8429	4.2213	16.8429
7	-0.1159	9.4336	2.6540	10.4336
8	-0.0744	23.5376	4.3522	24.5376
9	0.0575	29.0170	4.1806	30.0170
10	-0.4841	3.0190	2.8862	4.0190

TABLE D.3
1982 RANKED BY ROA3A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.8334	1.3996	8.3005	2.3996
2	-0.4657	34.2584	10.1306	35.2584
3	-0.3665	84.8157	13.5404	85.8157
4	-0.2934	72.5357	11.1664	73.5357
5	-0.2426	54.7142	8.8909	55.7142
6	-0.2127	64.4062	9.2667	65.4062
7	-0.1364	51.3548	7.3498	52.3548
8	-0.0990	47.0238	6.6632	48.0238
9	-0.0106	44.6849	5.8161	45.6849
10	-0.6511	2.0551	4.0109	3.0551
		ROA2 STATISTICS		
1	-0.8474	1.4312	9.2220	2.4312
2	-0.4807	57.7368	13.7669	58.7368
3	-0.3739	146.6087	18.2845	147.6087
4	-0.2867	147.5384	15.9780	148.5384
5	-0.2117	148.4615	14.7765	149.4615
6	-0.2005	245.1111	19.1877	246.1111
7	-0.1075	209.5000	15.6289	210.5000
8	-0.0543	181.9166	13.3016	182.9166
9	0.1583	117.9642	8.3882	118.9642
10	-0.8790	2.2819	13.9772	3.2819
		ROA3 STATISTICS		
1	-0.8488	1.4483	9.3514	2.4483
2	-0.4810	65.0980	14.6550	66.0980
3	-0.3724	178.3684	20.0783	179.3684
4	-0.2838	190.9000	18.3368	191.9000
5	-0.2087	244.0000	18.3657	245.0000
6	-0.1995	315.4285	21.1897	316.4285
7	-0.1065	281.3333	17.4208	282.3333
8	-0.0553	218.7000	15.0487	219.7000
9	0.1586	122.7777	8.5202	123.7777
10	-0.9281	2.0308	23.2137	3.0308
		ROE STATISTICS		
1	-0.8713	1.1057	10.2801	2.1057
2	-0.5060	7.0273	4.7358	8.0273
3	-0.3845	8.7706	4.0789	9.7706
4	-0.2946	5.9466	2.7368	6.9466
5	-0.2253	10.3331	3.3459	11.3331
6	-0.2139	15.5724	4.1793	16.5724
7	-0.1162	12.0085	3.0810	13.0085
8	-0.0676	25.0415	4.4735	26.0415
9	0.0672	42.7290	5.1961	43.4290
10	-0.4882	3.0534	2.9345	4.0534

TABLE D.4
1982 RANKED BY ROEA
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.8479	0.9279	8.1343	1.9279
2	-0.4725	2.7299	2.6620	3.7299
3	-0.3873	4.3455	2.7722	5.3455
4	-0.3270	3.7594	2.2413	4.7594
5	-0.2525	2.8615	1.6275	3.8615
6	-0.1970	3.2025	1.5542	4.2025
7	-0.1674	5.3355	2.0218	6.3355
8	-0.1459	7.5121	2.4164	8.5121
9	-0.0785	9.6807	2.5452	10.6807
10	-0.7107	2.0903	5.0775	3.0903
		ROA2 STATISTICS		
1	-0.8597	0.9470	8.9496	1.9470
2	-0.4801	2.7573	2.7284	3.7573
3	-0.3885	4.3209	2.7733	5.3209
4	-0.3278	4.0821	2.3555	5.0821
5	-0.2493	3.0719	1.6886	4.0719
6	-0.1908	3.3442	1.576	4.3442
7	-0.1356	6.4044	2.1492	7.4044
8	-0.0994	9.7113	2.6316	10.7113
9	0.0669	11.2112	2.2732	12.2112
10	-0.9273	2.3243	24.1137	3.3243
		ROA3 STATISTICS		
1	-0.8604	0.9473	9.0026	1.9473
2	-0.4774	2.8319	2.7467	3.8319
3	-0.3882	4.3523	2.7833	5.3523
4	-0.3259	4.0000	2.3188	5.0000
5	-0.2495	3.1025	1.6982	4.1025
6	-0.1920	3.4020	1.5968	4.4020
7	-0.1364	6.4259	2.1531	7.4259
8	-0.0981	9.6621	2.6190	10.6621
9	0.0714	11.3168	2.2757	12.3168
10	-0.9772	2.0752	75.9273	3.0752
		ROE STATISTICS		
1	-0.8355	4.2401	12.9184	5.2401
2	-0.4645	89.0268	16.7212	90.0268
3	-0.3761	244.2550	24.1083	245.2550
4	-0.3145	263.2690	22.7103	264.2690
5	-0.2341	304.6898	21.8330	305.6898
6	-0.1681	284.7997	19.3241	285.7997
7	-0.1240	338.5911	20.0366	339.5911
8	-0.1039	351.1212	19.9455	352.1212
9	0.1049	119.5508	8.9376	120.5508
10	-0.5020	3.0673	3.0498	4.0673

APPENDIX E
DECILE SUMMARIES--1983

TABLE E.1
1983 RANKED BY ROA1A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6890	2.5431	5.0540	3.5431
2	-0.4457	61.8181	13.4028	62.8181
3	-0.3640	121.7142	16.5432	122.7142
4	-0.3344	196.3333	20.3832	197.3333
5	-0.3240	470.2857	30.9447	471.2857
6	-0.2534	260.5000	20.7454	261.5000
7	-0.2381	303.7142	22.6387	304.7142
8	-0.2388	321.2000	22.0194	322.2000
9	-0.3840	204.0882	22.2023	205.0882
10	-0.5172	0.7211	1.7177	1.7211
		ROA2 STATISTICS		
1	-0.7051	2.3399	5.1991	3.3399
2	-0.4676	15.6504	6.6715	16.6504
3	-0.3891	26.0153	7.5178	27.0153
4	-0.3544	29.0500	7.4592	30.0500
5	-0.3446	25.6880	6.8725	26.6880
6	-0.2690	36.4047	7.3281	37.4047
7	-0.2653	35.7966	7.2818	36.7966
8	-0.2714	44.1111	8.2464	45.1111
9	-0.4564	56.9262	13.1010	57.9262
10	-0.4831	0.6802	1.5081	1.6802
		ROA3 STATISTICS		
1	-0.7020	2.1713	4.9762	3.1713
2	-0.4670	15.4000	6.6094	16.4000
3	-0.3870	24.5507	7.2605	25.5507
4	-0.3559	23.2266	6.6642	24.2266
5	-0.3575	36.9552	8.5956	37.9552
6	-0.2733	27.4821	6.3613	28.4821
7	-0.2683	25.1785	6.0020	26.1785
8	-0.2695	41.6973	7.9522	42.6973
9	-0.4499	45.7450	11.4321	46.7450
10	-0.4918	0.6813	1.5515	1.6813
		ROE STATISTICS		
1	-0.7243	1.0839	4.2368	2.0839
2	-0.4843	2.7105	2.7356	3.7105
3	-0.3927	4.2563	2.7753	5.2563
4	-0.3735	8.8489	4.0096	9.8489
5	-0.3541	12.1021	4.6044	13.1021
6	-0.2796	8.9862	3.3867	9.9862
7	-0.2779	13.7274	4.3149	14.7274
8	-0.2998	24.5865	6.2243	25.5865
9	-0.5638	33.8520	12.5369	34.8520
10	-0.1880	0.9561	0.7224	1.9561

TABLE E.2
1983 RANKED BY ROA2A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6962	2.3369	5.0142	3.3369
2	-0.4398	19.1111	7.0111	20.1111
3	-0.3835	25.7027	7.4086	26.7027
4	-0.3309	24.2987	6.5307	25.2987
5	-0.3418	67.9444	11.6237	68.9444
6	-0.2637	45.8809	8.2704	46.8809
7	-0.2243	51.3414	8.3772	52.3414
8	-0.2112	58.5238	8.7341	59.5238
9	-0.4032	109.7083	16.5733	110.7083
10	-0.5482	0.6261	1.8227	1.6261
		ROA2 STATISTICS		
1	-0.7186	2.4193	5.5730	3.4193
2	-0.4687	56.6176	13.2259	57.6176
3	-0.4114	144.6428	19.4173	145.6428
4	-0.3593	223.6666	22.2587	224.6666
5	-0.3602	541.4285	35.0906	542.4285
6	-0.2862	327.5000	24.5293	328.5000
7	-0.2385	357.3333	23.9017	358.3333
8	-0.2355	250.5000	19.6256	251.5000
9	-0.4410	249.3125	27.1766	250.3125
10	-0.5427	0.6385	1.7994	1.6385
		ROA3 STATISTICS		
1	-0.7154	2.2483	5.3337	3.2483
2	-0.4688	52.0540	12.7706	53.0540
3	-0.4091	86.0000	14.9362	87.0000
4	-0.3594	87.4347	13.7182	88.4347
5	-0.3731	503.6363	34.4964	504.6363
6	-0.2888	115.3529	14.2523	116.3529
7	-0.2451	67.0312	9.8507	68.0312
8	-0.2332	193.0000	17.1376	194.0000
9	-0.4355	126.5396	18.9543	127.5396
10	-0.5512	0.6473	1.8602	1.6473
		ROE STATISTICS		
1	-0.7400	1.0340	4.4864	2.0340
2	-0.4887	3.4601	3.1305	4.4601
3	-0.4172	5.5399	3.3882	6.5399
4	-0.3751	12.9603	4.9794	13.9603
5	-0.3711	21.2706	6.5051	22.2706
6	-0.3020	14.9754	4.7266	15.9754
7	-0.2626	18.6730	5.0154	19.6730
8	-0.2606	31.2809	6.6848	32.2809
9	-0.5556	80.4271	19.3085	81.4271
10	-0.2635	0.8996	0.8713	1.8996

TABLE E.3
1983 RANKED BY ROA3A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6986	2.2558	4.9865	3.2558
2	-0.4371	16.6228	6.4493	17.6228
3	-0.3857	21.4382	6.7269	22.4382
4	-0.3261	23.2875	6.3349	24.2875
5	-0.3442	64.1403	11.3055	65.1403
6	-0.2643	51.8918	8.8215	52.8918
7	-0.2253	49.9285	8.2148	50.9285
8	-0.2118	52.8043	8.3275	53.8043
9	-0.4131	98.4197	16.0418	99.4197
10	-0.5523	0.6238	1.8465	1.6238
		ROA2 STATISTICS		
1	-0.7210	2.3416	5.5544	3.3416
2	-0.4664	41.1276	11.1599	42.1276
3	-0.4131	106.5789	16.5746	107.5789
4	-0.3539	154.3076	18.1159	155.3076
5	-0.3637	420.6666	30.7678	421.6666
6	-0.2861	279.2857	22.4957	280.2857
7	-0.2384	304.2857	21.9953	305.2857
8	-0.2358	207.5000	17.8451	208.5000
9	-0.4535	229.4857	26.7854	230.4857
10	-0.5471	0.6367	1.8251	1.6367
		ROA3 STATISTICS		
1	-0.7203	2.2652	5.4619	3.2652
2	-0.4668	57.8235	13.2930	58.8235
3	-0.4119	142.6428	19.2084	143.6428
4	-0.3523	224.3333	22.0193	225.3333
5	-0.3757	789.8571	43.5546	790.8571
6	-0.2867	324.3333	24.2147	325.3333
7	-0.2375	356.0000	23.8689	357.0000
8	-0.2353	249.6000	19.7103	250.6000
9	-0.4444	244.7272	27.3175	245.7272
10	-0.5574	0.6472	1.9001	1.6472
		ROE STATISTICS		
1	-0.7446	1.0372	4.5901	2.0372
2	-0.4871	3.4477	3.1119	4.4477
3	-0.4215	5.8389	3.5207	6.8389
4	-0.3669	14.4093	5.2008	15.4093
5	-0.3740	22.7934	6.7929	23.7934
6	-0.2991	17.0303	5.0589	18.0303
7	-0.2556	20.8368	5.2777	21.8368
8	-0.2646	33.8195	7.0250	34.8195
9	-0.5596	90.6131	20.7370	91.6131
10	-0.2686	0.9003	0.8849	1.9003

TABLE E.4
1983 RANKED BY ROEA
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.7076	1.2351	4.1147	2.2351
2	-0.4759	3.1430	2.8828	4.1430
3	-0.3835	1.6144	1.6240	2.6144
4	-0.3615	2.7295	2.0259	3.7295
5	-0.3350	5.5744	2.8554	6.5744
6	-0.3116	6.2734	2.9167	7.2734
7	-0.2650	7.3890	2.9406	8.3890
8	-0.2409	9.6846	3.3083	10.6846
9	-0.1967	21.6329	4.9160	22.6329
10	-0.5447	0.8480	1.9861	1.8480
		ROA2 STATISTICS		
1	-0.7342	1.2727	4.6736	2.2727
2	-0.5007	3.6617	3.3236	4.6617
3	-0.4073	1.9269	1.8873	2.9269
4	-0.3841	3.2967	2.3663	4.2967
5	-0.3570	5.9925	3.1142	6.9925
6	-0.3321	7.2005	3.2860	8.2005
7	-0.2847	8.2293	3.2488	9.2293
8	-0.2619	10.9771	3.6942	11.9771
9	-0.2306	27.6489	5.9633	28.6489
10	-0.5379	0.8612	1.9529	1.8612
		ROA3 STATISTICS		
1	-0.7320	1.2089	4.5474	2.2089
2	-0.4987	3.6641	3.3090	4.6641
3	-0.4079	1.9681	1.9088	2.9681
4	-0.3843	3.3383	2.3844	4.3383
5	-0.3582	6.0681	3.1444	7.0681
6	-0.3445	12.3177	4.5686	13.3177
7	-0.2833	8.3155	3.2621	9.3155
8	-0.2634	11.0921	3.7252	12.0921
9	-0.2232	28.0267	5.9397	29.0267
10	-0.5484	0.8718	2.0297	1.8718
		ROE STATISTICS		
1	-0.7111	2.5829	5.5541	3.5829
2	-0.4978	219.4714	28.5725	220.4714
3	-0.3939	225.6278	23.8426	226.6278
4	-0.3843	431.8649	32.7900	432.8649
5	-0.3439	615.3620	36.8592	616.3620
6	-0.3388	957.5279	45.8351	958.5279
7	-0.3067	669.6028	36.3589	670.6028
8	-0.2791	306.2998	23.3239	307.2998
9	-0.3837	212.1993	22.6934	213.1993
10	-0.2680	0.9277	0.8968	1.9277

APPENDIX F
DECILE SUMMARIES--1984

TABLE F.1
1984 RANKED BY ROA1A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6589	2.6845	4.6289	3.6845
2	-0.3688	86.4583	13.8602	87.4583
3	-0.3501	256.4000	23.8221	257.4000
4	-0.3630	582.2857	38.0873	583.2857
5	-0.3115	559.6000	34.7631	560.6000
6	-0.2883	706.0000	35.2359	707.0000
7	-0.3582	756.0000	40.2942	757.0000
8	-0.4686	740.0000	49.0072	741.0000
9	-0.8046	178.9750	67.7487	179.9750
10	-0.3854	0.3897	0.9183	1.3897
		ROA2 STATISTICS		
1	-0.6595	2.1943	4.2508	3.1943
2	-0.3783	22.2386	6.7651	23.2386
3	-0.3569	63.3500	11.4024	64.3500
4	-0.3721	95.3571	14.5471	96.3571
5	-0.3092	50.1851	9.3857	51.1851
6	-0.2933	99.1428	13.1515	100.1428
7	-0.3476	104.2777	14.6554	105.2777
8	-0.4555	175.1315	23.5138	176.1315
9	-0.7716	52.2608	30.9107	53.2608
10	-0.3965	0.3953	0.9574	1.3953
		ROA3 STATISTICS		
1	-0.6548	2.1758	4.1626	3.1758
2	-0.3715	20.9361	6.4377	21.9361
3	-0.3556	58.7209	11.0454	59.7209
4	-0.3666	71.2592	12.4806	72.2592
5	-0.3090	47.6551	9.1141	48.6551
6	-0.2886	73.1842	11.0708	74.1842
7	-0.3389	83.7777	12.9990	84.7777
8	-0.4371	131.8076	19.4912	132.8076
9	-0.7398	31.1508	20.7895	32.1508
10	-0.4026	0.3968	0.9784	1.3968
		ROE STATISTICS		
1	-0.6959	1.0262	3.6817	2.0262
2	-0.3741	3.6150	2.4324	4.6150
3	-0.3680	9.9975	4.2471	10.9975
4	-0.3866	22.1314	6.8416	23.1314
5	-0.3188	17.4953	5.3134	18.4953
6	-0.2975	22.8348	5.9497	23.8348
7	-0.3697	40.0055	9.1602	41.0055
8	-0.4934	78.0874	16.5571	79.0874
9	-0.9886	32.4540	509.3063	33.4540
10	-0.1287	1.7472	0.9024	2.7472

TABLE F.2
1984 RANKED BY ROA2A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6587	2.4540	4.4456	3.4540
2	-0.3689	37.3703	8.8376	38.3703
3	-0.3410	101.5925	14.2851	102.5925
4	-0.3731	105.9459	15.6053	106.9459
5	-0.3136	109.9200	14.2463	110.9200
6	-0.3070	55.6964	9.8423	56.6964
7	-0.3460	106.9722	14.8260	107.9722
8	-0.4630	112.3703	18.8511	113.3703
9	-0.7629	57.3923	31.2317	58.3923
10	-0.3786	0.3640	0.8795	1.3640
		ROA2 STATISTICS		
1	-0.6704	2.6124	4.7681	3.6124
2	-0.3880	79.0800	13.7682	80.0800
3	-0.3512	274.3000	24.2879	275.3000
4	-0.3801	560.5714	38.4220	561.5714
5	-0.3162	549.2000	34.4326	550.2000
6	-0.3064	770.7500	38.0472	771.7500
7	-0.3300	778.8000	39.1104	779.8000
8	-0.4501	684.4444	45.5710	685.4444
9	-0.6771	179.6190	40.3935	180.6190
10	-0.4088	0.4153	1.0125	1.4153
		ROA3 STATISTICS		
1	-0.6663	2.5872	4.6765	3.5872
2	-0.3802	64.2903	11.9616	65.2903
3	-0.3497	210.1538	21.6487	211.1538
4	-0.3753	209.5000	22.4381	210.5000
5	-0.3163	276.8000	23.7082	277.8000
6	-0.2999	206.0000	19.7722	207.0000
7	-0.3237	357.2727	26.5202	358.2727
8	-0.4310	276.2173	28.1196	277.2173
9	-0.6450	55.2408	20.1033	56.2408
10	-0.4143	0.4164	1.0322	1.4164
		ROE STATISTICS		
1	-0.7092	1.0983	3.9815	2.0983
2	-0.3851	3.8495	2.5816	4.8495
3	-0.3628	10.9793	4.4321	11.9793
4	-0.3953	25.7698	7.5575	26.7698
5	-0.3255	20.5248	5.8792	21.5248
6	-0.3091	27.3904	6.7129	28.3904
7	-0.3534	54.8361	10.5569	55.8361
8	-0.5114	98.4187	19.4108	99.4187
9	-0.8829	60.3251	65.9120	61.3251
10	-0.1461	1.7862	0.9548	2.7862

TABLE F.3
1984 RANKED BY ROA3A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6561	2.4035	4.3645	3.4035
2	-0.3741	29.0289	7.7779	30.0289
3	-0.3381	60.1956	10.8841	61.1956
4	-0.3758	91.6904	14.3617	92.6904
5	-0.3107	81.3030	12.2288	82.3030
6	-0.2980	50.5084	9.2183	51.5084
7	-0.3557	95.1750	14.2814	96.1750
8	-0.4532	102.1034	17.6473	103.1034
9	-0.7343	50.6756	26.0921	51.6756
10	-0.3633	0.3713	0.8395	1.3713
		ROA2 STATISTICS		
1	-0.6677	2.5544	4.6750	3.5544
2	-0.3934	49.1000	10.6397	50.1000
3	-0.3478	102.5555	14.7058	103.5555
4	-0.3842	321.0833	28.1921	322.0833
5	-0.3156	224.0000	20.7519	225.0000
6	-0.2959	422.4285	29.2588	423.4285
7	-0.3375	426.6666	29.9287	427.6666
8	-0.4417	462.3076	37.9603	463.3076
9	-0.6446	125.7666	30.7619	126.7666
10	-0.3940	0.4241	0.9693	1.4241
		ROA3 STATISTICS		
1	-0.6662	2.6531	4.7270	3.6531
2	-0.3885	79.6400	13.7577	80.6400
3	-0.3503	279.5000	24.6628	280.5000
4	-0.3792	533.0000	36.9121	534.0000
5	-0.3132	540.2000	34.0216	541.2000
6	-0.2902	743.0000	36.6473	744.0000
7	-0.3332	778.2000	39.2997	779.2000
8	-0.4281	692.0000	44.2641	693.0000
9	-0.6086	176.5581	32.9824	177.5581
10	-0.4132	0.4431	1.0472	1.4431
		ROE STATISTICS		
1	-0.7106	1.0958	4.0027	2.0958
2	-0.3950	3.8113	2.6258	4.8113
3	-0.3636	11.6501	4.5896	12.6501
4	-0.4004	26.0053	7.6674	27.0053
5	-0.3182	20.3279	5.7739	21.3279
6	-0.3012	29.2584	6.8726	30.2584
7	-0.3703	62.6833	11.6733	63.6833
8	-0.4934	109.7960	19.7788	110.7960
9	-0.8582	153.2712	86.6375	154.2712
10	-0.1448	1.8157	0.9622	2.8157

TABLE F.4
1984 RANKED BY ROEA
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6316	1.0557	2.8917	2.0557
2	-0.4492	5.6969	3.7006	6.6969
3	-0.3621	4.1735	5.5662	5.1735
4	-0.3523	6.2766	3.1668	7.2766
5	-0.2913	5.1843	2.5086	6.1843
6	-0.3437	12.4405	4.5902	13.4405
7	-0.3700	12.7961	4.8988	13.7961
8	-0.4338	15.0736	6.0845	16.0736
9	-0.7094	30.4214	18.3077	31.4214
10	-0.3701	0.3705	0.8587	1.3705
		ROA2 STATISTICS		
1	-0.6454	1.0560	3.0441	2.0560
2	-0.4641	5.8712	3.8921	6.8712
3	-0.3676	4.3353	2.6533	5.3353
4	-0.3586	6.4489	3.2564	7.4489
5	-0.3047	5.3065	2.6135	6.3065
6	-0.3435	13.0664	4.7142	14.0664
7	-0.3585	14.7356	5.1844	15.7356
8	-0.4170	21.4448	7.1200	22.4448
9	-0.6446	50.4882	19.1902	51.4882
10	-0.4001	0.4226	0.9883	1.4226
		ROA3 STATISTICS		
1	-0.6412	1.1313	3.0693	2.1313
2	-0.4581	5.7211	3.7851	6.7211
3	-0.3674	4.4437	2.6895	5.4437
4	-0.3560	6.5766	3.2721	7.5766
5	-0.3072	5.4186	2.6567	6.4186
6	-0.3399	13.4226	4.7594	14.4226
7	-0.3488	15.0358	5.1533	16.0358
8	-0.4088	23.9113	7.4400	24.9113
9	-0.6192	51.5059	18.0304	52.5059
10	-0.4195	0.4417	1.0684	1.4417
		ROE STATISTICS		
1	-0.6270	2.6146	4.0994	3.6146
2	-0.4507	378.6362	34.4711	379.6362
3	-0.3568	569.8042	36.1372	570.8043
4	-0.3594	1285.5533	55.0098	1286.5533
5	-0.3216	1194.6867	49.9613	1195.6867
6	-0.3667	1774.3629	65.5529	1175.3629
7	-0.3872	1102.9202	53.2275	1103.9202
8	-0.4639	734.5604	49.6076	735.5604
9	-0.9813	309.0691	942.8812	310.0691
10	-0.1570	1.7970	0.9841	2.7970

APPENDIX G
DECILE SUMMARIES--1985

TABLE G.1
1985 RANKED BY ROA1A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6040	1.8061	3.2306	2.8061
2	-0.4306	155.2083	20.8914	156.2083
3	-0.3703	344.1111	28.2172	345.1111
4	-0.3466	507.1666	32.9007	508.1666
5	-0.3163	521.8000	32.2364	522.8000
6	-0.3656	563.3333	38.0532	564.3333
7	-0.4257	819.5714	47.7108	820.5714
8	-0.9338	739.9500	415.5098	740.9500
9	-6.4772	111.7777	-2.9378	112.7777
10	-0.3303	0.4127	0.7749	1.4127
		ROA2 STATISTICS		
1	-0.5932	1.6239	2.9827	2.6239
2	-0.4103	25.3333	7.7031	26.3333
3	-0.3537	56.2962	10.6803	57.2962
4	-0.3290	49.8387	9.6092	50.8387
5	-0.2850	35.4637	7.4247	36.4637
6	-0.3362	36.4606	8.2410	37.4606
7	-0.3744	41.0000	9.3518	42.0000
8	-0.7503	77.7096	34.5680	78.7096
9	-2.2268	23.3580	-5.0142	24.3580
10	-0.3428	0.3460	0.7654	1.3460
		ROA3 STATISTICS		
1	-0.5885	1.6381	2.9471	2.6381
2	-0.4045	25.1654	7.5781	26.1654
3	-0.3489	53.7017	10.3148	54.7017
4	-0.3274	46.9393	9.2670	47.9393
5	-0.2813	17.1832	4.9384	18.1832
6	-0.3265	34.0729	7.7968	35.0729
7	-0.3583	40.8370	9.0655	41.8370
8	-0.7292	68.4433	29.7434	69.4433
9	-2.1192	21.8211	-5.2693	22.8211
10	-0.3417	0.3426	0.7602	1.3426
		ROE STATISTICS		
1	-0.6141	1.1206	2.7740	2.1206
2	-0.4350	9.5267	4.7425	10.5267
3	-0.3562	8.6856	3.8343	9.6856
4	-0.3229	13.1122	4.5488	14.1122
5	-0.2773	8.1364	3.1828	9.1364
6	-0.3267	19.8373	5.7807	20.8373
7	-0.3591	24.6432	6.9020	25.6432
8	-0.7404	27.4250	19.5445	28.4250
9	-2.7054	31.5726	-4.3464	32.5726
10	-0.1323	0.0164	0.1619	1.0164

TABLE G.2
1985 RANKED BY ROA2A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6144	1.2988	2.9320	2.2988
2	-0.4245	16.7860	6.3318	17.7860
3	-0.3805	20.2272	6.4312	21.2272
4	-0.3730	20.8449	6.4689	21.8449
5	-0.3152	28.3809	6.9249	29.3809
6	-0.3743	24.3424	7.0333	25.3424
7	-0.3982	43.5522	10.1018	44.5522
8	-0.6925	37.7777	19.2732	38.7777
9	-4.6994	78.4659	-3.4084	79.4659
10	-0.3312	0.2410	0.6659	1.2410
		ROA2 STATISTICS		
1	-0.6096	1.7261	3.2301	2.7261
2	-0.4189	152.7500	20.2473	153.7500
3	-0.3741	338.6000	28.6635	339.6000
4	-0.3513	447.5000	31.1330	448.5000
5	-0.3024	592.8000	35.6126	593.8000
6	-0.3356	666.0000	38.1845	667.0000
7	-0.3501	825.7142	44.5993	826.7142
8	-0.5507	314.0000	37.9499	315.0000
9	-2.9571	268.5348	-9.3910	269.5348
10	-0.3629	0.2585	0.7611	1.2585
		ROA3 STATISTICS		
1	-0.6066	1.6863	3.1667	2.6863
2	-0.4098	138.5185	18.9668	139.5185
3	-0.3703	226.8000	22.8113	227.8000
4	-0.3472	209.6923	21.3176	210.6923
5	-0.3027	52.1851	9.5046	53.1851
6	-0.3265	137.4166	16.5968	138.4166
7	-0.3377	388.0000	28.7197	389.0000
8	-0.5252	132.2195	23.3014	133.2195
9	-2.7985	236.4489	-9.5724	237.4489
10	-0.3613	0.2549	0.7541	1.2549
		ROE STATISTICS		
1	-0.6357	1.0761	2.9562	2.0761
2	-0.4459	11.2724	5.3228	12.2724
3	-0.3730	10.5927	4.4305	11.5927
4	-0.3537	13.7139	4.9359	14.7139
5	-0.2999	15.6121	4.8223	16.6121
6	-0.3248	30.6748	7.3363	31.6748
7	-0.3426	36.1880	8.2770	37.1880
8	-0.5979	47.9232	16.3978	48.9232
9	-3.2647	156.7622	-6.5460	157.7622
10	-0.1475	0.0127	0.1805	1.0127

TABLE G.3
1985 RANKED BY ROA3A
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6141	1.2389	2.8779	2.2389
2	-0.4274	16.3244	6.2755	17.3244
3	-0.3761	19.4102	6.2388	20.4102
4	-0.3728	22.8429	6.7823	23.8429
5	-0.3192	25.7500	6.5927	26.7500
6	-0.3739	22.9480	6.8075	23.9480
7	-0.3705	41.4285	9.3463	42.4285
8	-0.7063	29.6284	17.8455	30.6284
9	-4.6238	81.5734	-3.5068	82.5734
10	-0.3312	0.2404	0.6655	1.2404
		ROA2 STATISTICS		
1	-0.6093	1.7001	3.2059	2.7001
2	-0.4219	103.0833	16.5374	104.0833
3	-0.3685	193.8235	21.0220	194.8235
4	-0.3477	248.7272	22.8918	249.7272
5	-0.3081	261.9090	22.7860	262.9090
6	-0.3338	254.3076	22.7023	255.3076
7	-0.3319	549.3000	34.3962	550.3000
8	-0.5625	160.2424	28.0133	161.2424
9	-2.9708	262.5842	-9.2280	263.5842
10	-0.3627	0.2574	0.7596	1.2574
		ROA3 STATISTICS		
1	-0.6091	1.6680	3.1798	2.6680
2	-0.4127	157.2500	20.3899	158.2500
3	-0.3641	331.7000	27.7938	332.7000
4	-0.3426	464.6666	31.3015	465.6666
5	-0.3024	570.6000	34.7007	571.6000
6	-0.3292	667.4000	38.0663	668.4000
7	-0.3200	920.1666	42.0175	921.1666
8	-0.5314	316.0000	36.7022	317.0000
9	-2.8775	266.7045	-9.7092	267.7045
10	-0.3622	0.2567	0.7579	1.2567
		ROE STATISTICS		
1	-0.6387	1.0308	2.9445	2.0308
2	-0.4494	11.3248	5.3766	12.3248
3	-0.3668	10.3170	4.3131	11.3170
4	-0.3492	14.6684	5.0830	15.6684
5	-0.3003	17.5290	5.1522	18.5290
6	-0.3254	37.6069	8.2112	38.6069
7	-0.3233	36.6943	8.0730	37.6943
8	-0.5970	75.8654	20.7553	76.8654
9	-3.3986	178.8961	-6.5916	179.8961
10	-0.1485	0.0132	0.1822	1.0132

TABLE G.4
1985 RANKED BY ROEA
DECILES

DEC	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		ROA1 STATISTICS		
1	-0.6066	0.7989	2.4097	1.7989
2	-0.4435	3.2091	2.6878	4.2091
3	-0.3606	3.5091	2.3219	4.5091
4	-0.3450	3.3391	2.1792	4.3391
5	-0.3432	6.9079	3.2828	7.9079
6	-0.3699	11.2511	4.5575	12.2511
7	-0.4954	10.7793	5.7953	11.7793
8	-0.7760	15.6795	17.2423	16.6975
9	-3.3737	62.7661	-4.3623	63.7661
10	-0.3274	0.2373	0.6538	1.2373
		ROA2 STATISTICS		
1	-0.5987	1.0205	2.5430	2.0205
2	-0.4368	3.9860	2.9660	4.9860
3	-0.3549	4.6164	2.6748	5.6164
4	-0.3442	4.2535	2.4951	5.2535
5	-0.3188	9.4161	3.7346	10.4161
6	-0.3373	15.7741	5.1838	16.7741
7	-0.4244	14.8611	5.9258	15.8611
8	-0.6579	29.7663	15.2200	30.7663
9	-2.3292	118.555	-9.2237	119.5555
10	-0.3497	0.2562	0.7506	1.2562
		ROA3 STATISTICS		
1	-0.5952	1.0136	2.5067	2.0136
2	-0.4330	4.0786	2.9741	5.0786
3	-0.3501	4.8633	2.7275	5.8633
4	-0.3416	4.3543	2.5145	5.3543
5	-0.3135	9.4750	3.7137	10.4750
6	-0.3213	16.5215	5.1677	17.5215
7	-0.4141	15.4917	5.9326	16.4917
8	-0.6375	31.5172	14.7499	32.5172
9	-2.2532	119.8883	-9.7794	120.8883
10	-0.3592	0.2554	0.7486	1.2554
		ROE STATISTICS		
1	-0.5759	3.7141	4.1204	4.7141
2	-0.4157	277.3806	27.5535	278.3806
3	-0.3470	651.4592	38.1249	652.4592
4	-0.3439	822.8406	42.7647	823.8406
5	-0.3232	1590.9161	57.9578	1591.9161
6	-0.3239	2113.9934	67.0344	2114.9934
7	-0.4467	658.1847	45.4110	659.1847
8	-0.7724	423.1054	89.5094	424.1054
9	-3.3106	255.8507	-7.9373	256.9507
10	-0.1442	0.0163	0.1780	1.0163

APPENDIX H
QUARTILE SUMMARIES--1979

TABLE H.1
1979 QUARTILES (1 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA1A		
		ROA1 STATISTICS		
1	-0.4923	1.4775	2.0996	2.4775
2	-0.1249	23.4210	4.6469	24.4210
3	0.0296	37.2000	5.0059	38.2000
4	1.0934	1.4613	-0.2505	2.4613
		ROA2 STATISTICS		
1	-0.5237	1.4522	2.2887	2.4522
2	-0.1470	15.6666	3.8054	16.6666
3	0.0067	25.0540	4.0636	26.0540
4	1.1046	1.4141	-0.2616	2.4141
		ROA3 STATISTICS		
1	-0.5224	1.4557	2.2814	2.4557
2	-0.1471	13.0434	3.3987	14.0434
3	0.0092	19.6808	3.5166	20.6808
4	1.0919	1.4376	-0.2536	2.4376
		ROE STATISTICS		
1	-0.5513	0.8702	2.0479	1.8702
2	-0.1709	3.0014	1.4128	4.0014
3	-0.0192	4.5165	1.3948	5.5165
4	0.8125	1.4771	-0.1316	2.4771
		RANKED BY ROA2A		
		ROA1 STATISTICS		
1	-0.4914	1.4315	2.0665	2.4315
2	-0.1282	17.6530	3.9348	18.6530
3	0.0329	25.9166	4.0128	26.9166
4	1.0680	1.4488	-0.2433	2.4488
		ROA2 STATISTICS		
1	-0.5244	1.4848	2.3153	2.4848
2	-0.1534	22.7948	4.7908	23.7948
3	0.0117	38.2400	5.1899	39.2400
4	1.1488	1.4475	-0.2718	2.4475
		ROA3 STATISTICS		
1	-0.5230	1.4865	2.3071	2.4865
2	-0.1540	17.7400	4.0930	18.7400
3	0.0144	26.7777	4.1769	27.7777
4	1.1375	1.4738	-0.2642	2.4738
		ROE STATISTICS		
1	-0.5516	0.8854	2.0628	1.8854
2	-0.1772	3.1387	1.4727	4.1387
3	-0.0147	5.1257	1.5120	6.1257
4	0.8448	1.4975	-0.1433	2.4975

TABLE H.2
1979 QUARTILES (2 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA3A		
		ROA1 STATISTICS		
1	-0.4907	1.4016	2.0423	2.4016
2	-0.1260	15.8867	3.6904	16.8867
3	0.0292	22.7142	3.7155	23.7142
4	1.0571	1.4410	-0.2406	2.4410
		ROA2 STATISTICS		
1	-0.5238	1.4531	2.2893	2.4531
2	-0.1513	20.1395	4.4257	21.1395
3	0.0078	31.5806	4.6568	32.5086
4	1.1375	1.4372	-0.2695	2.4372
		ROA3 STATISTICS		
1	-0.5242	1.5032	2.3258	2.5032
2	-0.1512	22.5384	4.7356	23.5384
3	0.0102	39.8400	5.3297	40.8400
4	1.1610	1.4769	-0.2718	2.4769
		ROE STATISTICS		
1	-0.5528	0.8888	2.0733	1.8888
2	-0.1750	2.9934	1.4223	3.9934
3	-0.0194	6.4517	1.7838	7.4517
4	0.8657	1.4976	-0.1529	2.4976
		RANKED BY ROEA		
		ROA1 STATISTICS		
1	-0.5057	0.5966	1.5567	1.5966
2	-0.1566	1.6732	0.9373	2.6732
3	0.0022	2.8664	0.9630	3.8664
4	0.9583	1.3780	-0.2126	2.3780
		ROA2 STATISTICS		
1	-0.5376	0.6198	1.7525	1.6198
2	-0.1836	1.7784	1.0420	2.7784
3	-0.0215	3.0039	1.0451	4.0039
4	1.0189	1.3753	-0.2367	2.3753
		ROA3 STATISTICS		
1	-0.5380	0.6424	1.7742	1.6424
2	-0.1831	1.7947	1.0456	2.7947
3	-0.0193	3.2480	1.1003	4.2480
4	1.0378	1.4081	-0.2383	2.4081
		ROE STATISTICS		
1	-0.5314	1.9672	2.6764	2.9672
2	-0.1777	29.3275	5.6975	30.3275
3	-0.0185	44.3920	5.8650	45.3920
4	1.0634	1.6683	-0.2083	2.6683

APPENDIX I
QUARTILE SUMMARIES--1980

TABLE I.1
1980 QUARTILES (1 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA1A		
		ROA1 STATISTICS		
1	-0.5623	1.0307	2.2559	2.0307
2	-0.1251	26.4166	5.0060	27.4166
3	0.0877	27.4285	3.9249	28.4285
4	1.1374	1.8551	-0.2707	2.8551
		ROA2 STATISTICS		
1	-0.6033	0.9705	2.5381	1.9705
2	-0.1582	16.5851	3.9901	17.5851
3	0.0550	13.1805	2.5596	14.1805
4	1.1673	1.7462	-0.2354	2.7462
		ROA3 STATISTICS		
1	-0.6022	0.9546	2.5154	1.9546
2	-0.1566	15.4554	3.8205	16.4554
3	0.0569	10.3706	2.1847	11.3406
4	1.1605	1.6533	-0.2461	2.6533
		ROE STATISTICS		
1	-0.6185	0.6416	2.3586	1.6416
2	-0.1740	3.7534	1.6396	4.7534
3	0.0316	4.6996	1.3141	5.6996
4	0.9374	2.1528	-0.0835	3.1528
		RANKED BY ROA2A		
		ROA1 STATISTICS		
1	-0.5652	0.9913	2.2459	1.9913
2	-0.1254	15.6161	3.6637	16.6161
3	-0.0922	13.6619	2.5104	14.6619
4	1.2423	1.7521	-0.2601	2.7521
		ROA2 STATISTICS		
1	-0.6113	1.0424	2.6779	2.0424
2	-0.1599	26.2833	5.2333	27.2833
3	0.0550	28.4722	4.1787	29.4722
4	1.3198	1.8066	-0.2778	2.8066
		ROA3 STATISTICS		
1	-0.6102	1.0272	2.6529	2.0272
2	-0.1583	24.7187	5.0276	25.7187
3	0.0569	19.5961	3.2863	20.5961
4	1.3115	1.7094	-0.2880	2.7094
		ROE STATISTICS		
1	-0.6267	0.6677	2.4595	1.6677
2	-0.7655	4.3269	1.8028	5.3269
3	0.0296	6.3119	1.6261	7.3119
4	1.0546	2.1997	-0.1293	3.1997

TABLE I.2
1980 QUARTILES (2 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA3A ROA1 STATISTICS		
1	-0.5648	0.9828	2.2358	1.9828
2	-0.1249	15.0882	3.5740	16.0882
3	0.0917	13.2602	2.4488	14.2602
4	1.2308	1.7452	-0.2572	2.7452
		ROA2 STATISTICS		
1	-0.6110	1.0328	2.6651	2.0328
2	-0.1595	24.9682	5.0424	25.9682
3	0.0545	27.6486	4.0775	28.6486
4	1.3093	1.8002	-0.2754	2.8002
		ROA3 STATISTICS		
1	-0.6105	1.0409	2.6680	2.0409
2	-0.1583	26.3500	5.2080	27.3500
3	0.0555	28.3333	4.1567	29.3333
4	1.3328	1.7121	-0.2941	2.7121
		ROE STATISTICS		
1	-0.6271	0.6708	2.4668	1.6708
2	-0.1768	4.3609	1.8131	5.3609
3	0.0293	6.9157	1.7334	7.9157
4	1.0683	2.2088	-0.1339	3.2088
		RANKED BY ROEA ROA1 STATISTICS		
1	-0.5674	0.3985	1.7337	1.3985
2	-0.1477	1.4725	0.8449	2.4725
3	0.0396	3.8176	1.1114	4.8176
4	1.0473	1.5680	-0.2172	2.5680
		ROA2 STATISTICS		
1	-0.6107	0.4490	2.0923	1.4490
2	-0.1894	1.6407	1.0033	2.6407
3	0.0090	4.4025	1.3022	5.4025
4	1.0820	1.5830	-0.2280	2.5830
		ROA3 STATISTICS		
1	-0.6100	0.4582	2.0966	1.4582
2	-0.1894	1.6528	1.0099	2.6528
3	0.0101	4.4671	1.3126	5.4671
4	1.1058	1.5123	-0.2473	2.5123
		ROE STATISTICS		
1	-0.5951	1.5988	2.9815	2.5988
2	-0.1782	24.4731	5.1415	25.4731
3	0.0207	49.6964	5.9758	50.6964
4	1.2539	2.3886	-0.1832	3.3886

APPENDIX J
QUARTILE SUMMARIES--1981

TABLE J.1
1981 QUARTILES (1 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA1A		
		ROA1 STATISTICS		
1	-0.6113	1.1246	2.7502	2.1246
2	-0.2450	33.6666	6.7816	34.6666
3	-0.1073	21.1914	4.2857	22.1914
4	0.5028	2.1531	0.1818	3.1531
		ROA2 STATISTICS		
1	-0.6609	1.0871	3.2605	2.0871
2	-0.2866	20.4566	5.5011	21.4566
3	-0.1447	11.8444	3.1987	12.8444
4	0.4972	2.0035	0.1575	3.0035
		ROA3 STATISTICS		
1	-0.6595	1.0928	3.2496	2.0928
2	-0.2849	19.7121	5.3651	20.7121
3	-0.1465	10.2403	2.9244	11.2403
4	0.4914	1.9882	0.1589	2.9882
		ROE STATISTICS		
1	-0.6718	1.0998	3.4156	2.0998
2	-0.2952	5.5033	2.6185	6.5033
3	-0.1569	4.2636	1.7213	5.2636
4	0.1948	0.3553	-0.0256	1.3553
	(0.2632)	(3.4362)	(0.6673)	(4.4362)
		RANKED BY ROA2A		
		ROA1 STATISTICS		
1	-0.6120	1.0990	2.7344	2.0990
2	-0.2465	26.6210	5.9637	27.6210
3	-0.1052	13.5972	3.2564	14.5972
4	0.4704	2.0275	0.1831	3.0275
		ROA2 STATISTICS		
1	-0.6638	1.1942	3.4072	2.1942
2	-0.2918	34.5454	7.4444	35.5454
3	-0.1473	23.0208	4.7697	24.0208
4	0.6254	2.0194	0.0690	3.0194
		ROA3 STATISTICS		
1	-0.6624	1.2009	3.3949	2.2009
2	-0.2901	32.4634	7.1431	33.4634
3	-0.1487	17.8225	4.1056	18.8225
4	0.6162	2.0011	0.0720	3.0011
		ROE STATISTICS		
1	-0.6752	1.1879	3.5545	2.1879
2	-0.3006	6.4345	2.8989	7.4345
3	-0.1589	5.3977	2.0075	6.3977
4	0.2771	0.3623	-0.0861	1.3623
	(0.3542)	(3.4548)	(0.5585)	(4.4548)

TABLE J.2
1981 QUARTILES (2 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA3A		
		ROA1 STATISTICS		
1	-0.6116	1.0820	2.7147	2.0820
2	-0.2463	25.2400	5.7991	26.2400
3	-0.1093	13.2533	3.2439	14.2533
4	0.4709	2.0067	0.1788	3.0067
		ROA2 STATISTICS		
1	-0.6634	1.1787	3.3853	2.1787
2	-0.2917	32.3414	7.1765	33.3414
3	-0.1511	22.4200	4.6989	23.4200
4	0.6253	1.9994	0.0655	2.9994
		ROA3 STATISTICS		
1	-0.6628	1.2153	3.4148	2.2153
2	-0.2908	34.6103	7.4182	35.6103
3	-0.1507	23.5833	4.8488	24.5833
4	0.6419	2.0164	0.0578	3.0164
		ROE STATISTICS		
1	-0.6757	1.1936	3.5672	2.1936
2	-0.3018	6.3777	2.8907	7.3777
3	-0.1616	6.1362	2.1863	7.1362
4	0.3003	0.3622	-0.1024	1.3622
	(0.3795)	(3.4862)	(0.5353)	(4.4862)
		RANKED BY ROEA		
		ROA1 STATISTICS		
1	-0.6163	0.5601	2.2551	1.5601
2	-0.2718	1.8341	1.3125	2.8341
3	-0.1306	1.8743	0.9497	2.8743
4	0.3780	2.3800	0.3342	3.3800
		ROA2 STATISTICS		
1	-0.6680	0.6574	2.8789	1.6574
2	-0.3170	1.8929	1.4954	2.8929
3	-0.1735	2.1696	1.1556	3.1696
4	0.4738	2.3340	0.2390	3.3340
		ROA3 STATISTICS		
1	-0.6672	0.6896	2.9064	1.6896
2	-0.3173	1.8927	1.4913	2.8927
3	-0.1721	2.1815	1.1547	3.1815
4	-0.4876	2.3500	0.2303	3.3500
		ROE STATISTICS		
1	-0.6544	-0.2433	1.5172	0.7566
	(-0.6512)	(2.5881)	(4.4319)	(3.5881)
2	-0.3066	29.2582	6.9337	30.2582
3	-0.1589	28.0636	5.4099	29.0636
4	0.4755	3.9204	0.5033	4.9204

APPENDIX K
QUARTILE SUMMARIES--1982

TABLE K.1
1982 QUARTILES (1 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA1A		
		ROA1 STATISTICS		
1	-0.6416	1.1871	3.1277	2.1871
2	-0.2858	39.9833	8.0019	40.9833
3	-0.1597	42.6341	6.8353	43.6341
4	0.9273	1.9581	-0.1076	2.9581
		ROA2 STATISTICS		
1	-0.6509	1.1297	3.1804	2.1297
2	-0.2739	18.9682	5.1665	19.9682
3	-0.1318	18.7684	4.1082	19.7684
4	2.2527	1.9317	-0.4736	2.9317
		ROA3 STATISTICS		
1	-0.6498	1.1161	3.1543	2.1161
2	-0.2719	18.5736	5.0784	19.5736
3	-0.1311	18.2551	4.0548	19.2551
4	2.1243	1.6899	-0.4750	2.6899
		ROE STATISTICS		
1	-0.6555	1.7285	3.7956	2.7285
2	-0.2830	7.0044	2.9465	8.0044
3	-0.1416	8.0309	2.5011	9.0309
4	1.0210	2.6945	-0.0489	3.6945
		RANKED BY ROA2A		
		ROA1 STATISTICS		
1	-0.6460	1.2162	3.2058	2.2162
2	-0.2843	28.2405	6.5705	29.2405
3	-0.1694	27.1492	5.4107	28.1492
4	0.9059	1.8940	-0.1074	2.8940
		ROA2 STATISTICS		
1	-0.6590	1.2640	3.4128	2.2640
2	-0.2740	37.1475	7.5100	38.1475
3	-0.1467	44.8837	6.9737	45.8837
4	3.5235	1.9524	-0.6201	2.9524
		ROA3 STATISTICS		
1	-0.6573	1.2565	3.3875	2.2565
2	-0.2725	35.2812	7.2730	36.2812
3	-0.1453	42.0217	6.7098	43.0217
4	3.2185	1.7077	-0.6099	2.7077
		ROE STATISTICS		
1	-0.6654	1.9159	4.1034	2.9159
2	-0.2826	7.6239	3.0939	8.6239
3	-0.1556	11.6766	3.2168	12.6766
4	1.7811	2.7012	-0.3082	3.7012

TABLE K.2
1982 QUARTILES (2 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA3A		
		ROA1 STATISTICS		
1	-0.6439	1.1744	3.1421	2.1744
2	-0.2884	28.0609	6.5691	29.0609
3	-0.1680	26.5735	5.3107	27.5735
4	0.8843	1.8914	-0.0975	2.8914
		ROA2 STATISTICS		
1	-0.6567	1.2249	3.3452	2.2249
2	-0.2781	35.8769	7.4301	36.8769
3	-0.1448	42.5333	6.7565	43.5333
4	3.4118	1.9475	-0.6108	2.9475
		ROA3 STATISTICS		
1	-0.6574	1.2203	3.3501	2.2203
2	-0.2759	38.3114	7.6638	39.3114
3	-0.1437	44.6511	6.9173	45.6511
4	3.5148	1.7628	-0.6318	2.7638
		ROE STATISTICS		
1	-0.6647	1.8167	4.0064	2.8167
2	-0.2864	8.1082	3.2293	9.1082
3	-0.1540	12.4701	3.3386	13.4701
4	1.9783	2.7332	-0.3512	3.7332
		RANKED BY ROEA		
		ROA1 STATISTICS		
1	-0.6517	0.8322	2.8866	1.8322
2	-0.3103	3.1700	1.9620	4.1700
3	-0.1738	3.9417	1.6902	4.9417
4	0.4872	1.8001	0.1251	2.8001
		ROA2 STATISTICS		
1	-0.6609	0.8333	2.9942	1.8333
2	-0.3099	3.3389	2.0195	4.3389
3	-0.1570	4.5616	1.7992	5.5616
4	1.7462	1.8509	-0.3851	2.8509
		ROA3 STATISTICS		
1	-0.6609	0.8270	2.9865	1.8270
2	-0.3090	3.3319	2.0131	4.3319
3	-0.1572	4.6022	1.8074	5.6022
4	1.8216	1.6825	-0.4195	2.6825
		ROE STATISTICS		
1	-0.6377	3.3596	4.7644	4.3596
2	-0.2968	44.1883	8.5603	45.1883
3	-0.1433	51.1749	7.4323	52.1749
4	4.3247	2.7964	-0.6340	3.7964

APPENDIX L
QUARTILE SUMMARIES--1983

TABLE L.1
1983 QUARTILES (1 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA1A		
		ROA1 STATISTICS		
1	-0.5598	1.7977	2.8004	2.7977
2	-0.3308	42.8703	8.8835	43.8703
3	-0.2369	51.0256	8.4079	52.0256
4	-0.8190	0.8019	6.4169	1.8019
		ROA2 STATISTICS		
1	-0.5788	1.6181	2.8419	2.6181
2	-0.3527	16.9179	5.5428	17.9179
3	-0.2586	25.0000	5.8574	26.0000
4	-0.6906	0.7694	3.3003	1.7694
		ROA3 STATISTICS		
1	-0.5769	1.5226	2.7536	2.5226
2	-0.3572	20.9154	6.2791	21.9154
3	-0.2615	20.4020	5.2725	21.4020
4	-0.7463	0.7682	4.2424	1.7682
		ROE STATISTICS		
1	-0.5856	1.2117	2.5896	2.2117
2	-0.3640	8.7160	3.9017	9.7160
3	-0.2791	12.0506	3.9904	13.0506
4	1.0217	1.0320	-0.2949	2.0320
		RANKED BY ROA2A		
		ROA1 STATISTICS		
1	-0.5626	1.6732	2.7385	2.6732
2	-0.3424	23.4414	6.5159	24.4414
3	-0.2385	26.4444	5.9185	27.4444
4	-1.0001	0.7643	-93.5648	1.7643
		ROA2 STATISTICS		
1	-0.5882	1.6748	2.9722	2.6748
2	-0.3678	49.5272	10.2845	50.5272
3	-0.2583	50.8974	8.7469	51.8974
4	-0.9505	0.7729	25.9244	1.7729
		ROA3 STATISTICS		
1	-0.5863	1.5780	2.8814	2.5780
2	-0.3719	54.1428	10.8068	55.1428
3	-0.2618	36.7407	7.2941	37.7407
4	-1.0053	0.7749	-86.0276	1.7749
		ROE STATISTICS		
1	-0.5973	1.1921	2.6774	2.1921
2	-0.3795	13.0455	5.0399	14.0455
3	-0.2771	14.9283	4.5213	15.9283
4	0.3087	1.0376	0.0906	2.0376

TABLE L.2
1983 QUARTILES (2 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA3A		
		ROA1 STATISTICS		
1	-0.5629	1.6474	2.7234	2.6474
2	-0.3420	21.9915	6.3031	22.9915
3	-0.1241	26.0945	5.8423	27.0945
4	-1.0083	0.7642	-92.8136	1.7642
		ROA2 STATISTICS		
1	-0.5885	1.6526	2.9585	2.6526
2	-0.3675	46.9827	9.9882	47.9827
3	-0.2593	48.1951	8.4792	49.1951
4	-0.9588	0.7730	31.3835	1.7730
		ROA3 STATISTICS		
1	-0.5882	1.5944	2.9124	2.5944
2	-0.3711	62.1090	11.6764	63.1090
3	-0.2593	50.6923	8.7064	51.6923
4	-1.0100	0.7798	-87.3593	1.7798
		ROE STATISTICS		
1	-0.5996	1.1910	2.6969	2.1910
2	-0.3785	14.0393	5.2407	15.0393
3	-0.2739	16.5434	4.7684	17.5434
4	0.2837	1.0400	0.1125	2.0400
		RANKED BY ROEA		
		ROA1 STATISTICS		
1	-0.5711	1.1429	2.4137	2.1429
2	-0.3590	3.1289	2.1718	4.1289
3	-0.2796	6.3846	2.7728	7.3846
4	-1.6126	0.7466	-3.1573	1.7466
		ROA2 STATISTICS		
1	-0.5976	1.1357	2.6325	2.1357
2	-0.3818	3.5987	2.4684	4.5987
3	-0.3001	7.1165	3.0683	8.1165
4	-1.6197	0.7552	-3.1378	1.7552
		ROA3 STATISTICS		
1	-0.5961	1.0722	2.5645	2.0722
2	-0.3826	3.6524	2.4938	4.6524
3	-0.3051	9.3117	3.6220	10.3117
4	-1.6983	0.7615	-2.9003	1.7615
		ROE STATISTICS		
1	-0.5831	3.2825	3.9642	4.2825
2	-0.3752	76.1387	13.0594	77.1387
3	-0.3126	113.5016	14.5677	114.5016
4	-0.0954	0.9919	0.5602	1.9919

APPENDIX M
QUARTILE SUMMARIES--1984

TABLE M.1
1984 QUARTILES (1 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA1A ROA1 STATISTICS		
1	-0.5155	2.3266	2.7657	3.3266
2	-0.3356	84.0000	12.9416	85.0000
3	-0.3241	102.5312	14.1618	103.5312
4	-0.0834	0.6450	0.3994	1.6450
		ROA2 STATISTICS		
1	-0.5197	2.0296	2.6240	3.0296
2	-0.3400	38.4938	8.5457	39.4938
3	-0.3212	54.1166	9.9268	55.1166
4	-0.1214	0.6458	0.4602	1.6458
		ROA3 STATISTICS		
1	-0.5151	2.0100	2.5786	3.0100
2	-0.3369	35.7441	8.1225	36.7441
3	-0.3123	47.9705	9.1915	48.9705
4	-0.1392	0.6516	0.4930	1.6516
		ROE STATISTICS		
1	-0.5262	1.6056	2.4070	2.6056
2	-0.3510	16.7120	5.4854	17.7120
3	-0.3325	29.1674	7.2294	30.1674
4	0.6814	1.9726	0.0253	2.9726
		RANKED BY ROA2A ROA1 STATISTICS		
1	-0.5146	2.2116	2.6914	3.2116
2	-0.3376	50.9354	9.8846	51.9354
3	-0.3335	57.2205	10.4608	58.2205
4	-0.0869	0.5639	0.3696	1.5639
		ROA2 STATISTICS		
1	-0.5284	2.2635	2.8304	3.2635
2	-0.3444	83.0263	13.0263	84.0263
3	-0.3273	125.8709	15.6134	126.8709
4	-0.2337	0.6008	0.6513	1.6008
		ROA3 STATISTICS		
1	-0.5237	2.2379	2.7789	3.2379
2	-0.3417	70.4545	11.8469	71.4545
3	-0.3176	93.2619	13.2030	94.2619
4	-0.2530	0.6077	0.6975	1.6077
		ROE STATISTICS		
1	-0.5372	1.7107	2.5579	2.7107
2	-0.3544	18.9581	5.9207	19.9581
3	-0.3407	39.6931	8.6767	40.6931
4	0.5107	1.9399	0.1349	2.9399

TABLE M.2
1984 QUARTILES (2 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA3A		
		ROA1 STATISTICS		
1	-0.5136	2.0794	2.6074	3.0794
2	-0.3384	44.4109	9.1772	45.4109
3	-0.3331	54.7042	10.2105	55.7042
4	-0.0767	0.5626	0.3539	1.5626
		ROA2 STATISTICS		
1	-0.5276	2.1242	2.7409	3.1242
2	-0.3461	69.0638	11.7587	70.0638
3	-0.3266	114.5882	14.9349	115.5882
4	-0.2300	0.6002	0.6431	1.6002
		ROA3 STATISTICS		
1	-0.5258	2.1637	2.7508	3.1637
2	-0.3438	84.3421	13.1068	85.3421
3	-0.3193	122.7812	15.4493	123.7812
4	-0.2840	0.6197	0.7777	1.6197
		ROE STATISTICS		
1	-0.5392	1.5651	2.4760	2.5651
2	-0.3574	19.7926	6.0959	20.7926
3	-0.3422	44.2685	9.2288	45.2685
4	0.4557	1.9644	0.1826	2.9644
		RANKED BY ROEA		
		ROA1 STATISTICS		
1	-0.5231	1.7314	2.4660	2.7314
2	-0.3295	5.4436	2.7880	6.4436
3	-0.3589	12.5457	4.7408	13.5457
4	-0.0178	0.5676	0.2748	1.5676
		ROA2 STATISTICS		
1	-0.5367	1.7157	2.5578	2.7157
2	-0.3380	5.5682	2.8694	6.5682
3	-0.3533	13.7481	4.9361	14.7481
4	-0.1996	0.6065	0.5836	1.6065
		ROA3 STATISTICS		
1	-0.5328	1.7132	2.5266	2.7132
2	-0.3379	5.6725	2.9028	6.6725
3	-0.3492	14.7364	5.0934	15.7364
4	-0.2717	0.6200	0.7478	1.6200
		ROE STATISTICS		
1	-0.5232	4.0900	3.7325	5.0900
2	-0.3430	180.4546	19.5046	181.4546
3	-0.3846	210.8798	22.6556	211.8798
4	0.3288	1.8949	0.2804	2.8949

APPENDIX N
QUARTILE SUMMARIES--1985

TABLE N.1
1985 QUARTILES (1 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA1A ROA1 STATISTICS		
1	-0.5006	2.6862	2.8445	3.6862
2	-0.3530	76.0000	12.5060	77.0000
3	-0.4456	101.3333	17.3365	102.3333
4	-0.0119	0.6842	0.3135	1.6842
		ROA2 STATISTICS		
1	-0.4863	2.3172	2.5451	3.3172
2	-0.3290	30.2637	7.3190	31.2637
3	-0.3951	30.0714	8.2122	31.0714
4	0.0259	0.6270	0.2432	1.6270
		ROA3 STATISTICS		
1	-0.4808	2.3150	2.5066	3.3150
2	-0.3266	22.9487	6.2615	23.9487
3	-0.3838	28.6503	7.8443	29.6503
4	0.0196	0.6286	0.2515	1.6286
		ROE STATISTICS		
1	-0.4936	3.3718	3.1295	4.3718
2	-0.3240	9.3168	3.7514	10.3168
3	-0.3934	22.1332	6.9297	23.1332
4	0.3348	0.1578	-0.1938	1.1578
		RANKED BY ROA2A ROA1 STATISTICS		
1	-0.5157	2.1829	2.6844	3.1829
2	-0.3481	17.8846	5.6730	18.8846
3	-0.4070	26.1882	7.7877	27.1882
4	0.0266	0.6734	0.2600	1.6734
		ROA2 STATISTICS		
1	-0.5086	2.5784	2.8504	3.5784
2	-0.3365	79.7222	12.4701	80.7222
3	-0.3534	108.1250	15.0694	109.1250
4	-0.0311	0.7015	0.3463	1.7015
		ROA3 STATISTICS		
1	-0.5039	2.5671	2.8074	3.5671
2	-0.3332	48.8965	9.5782	49.8965
3	-0.3399	83.5192	12.9016	84.5192
4	-0.0353	0.7018	0.3523	1.7018
		ROE STATISTICS		
1	-0.5229	3.4351	3.4143	4.4351
2	-0.3332	12.4485	4.5002	13.4485
3	-0.3436	29.6772	7.4385	30.6772
4	0.2692	0.1773	-0.1451	1.1773

TABLE N.2
1985 QUARTILES (2 OF 2)

QRT	CHANGE IN MEAN	CHANGE IN VARIANCE	CHANGE IN C.V.	F
		RANKED BY ROA1A		
		ROA1 STATISTICS		
1	-0.5153	2.1412	2.6557	3.1412
2	-0.3490	17.6645	5.6406	18.6645
3	-0.3959	24.9715	7.4319	25.9715
4	0.0389	0.6716	0.2444	1.6716
		ROA2 STATISTICS		
1	-0.5079	2.5300	2.8183	3.5300
2	-0.3370	68.2380	11.5691	69.2380
3	-0.3443	88.7916	13.4318	89.7916
4	-0.0174	0.6998	0.3268	1.6998
		ROA3 STATISTICS		
1	-0.5045	2.5185	2.7857	3.5185
2	-0.3311	80.0833	12.3736	81.0833
3	-0.3325	107.6500	14.6971	108.6500
4	-0.0272	0.7044	0.3421	1.7044
		ROE STATISTICS		
1	-0.5238	3.3418	3.3758	4.3418
2	-0.3313	13.1966	4.6348	14.1966
3	-0.3363	32.5889	7.7324	33.5889
4	0.2721	0.1778	-0.1469	1.1778
		RANKED BY ROEA		
		ROA1 STATISTICS		
1	-0.5072	1.4357	2.1666	2.4357
2	-0.3447	4.2768	2.5072	5.2768
3	-0.4565	10.4223	5.2201	11.4223
4	0.0474	0.6606	0.2303	1.6606
		ROA2 STATISTICS		
1	-0.5007	1.6186	2.2419	2.6186
2	-0.3351	5.5563	2.8500	6.5563
3	-0.4001	14.6797	5.6002	15.6797
4	-0.0118	0.6924	0.3165	1.6924
		ROA3 STATISTICS		
1	-0.4970	1.6137	2.2141	2.6137
2	-0.3315	5.6674	2.8614	6.6674
3	-0.3868	15.2281	5.5717	16.2281
4	-0.0230	0.6983	0.3339	1.6983
		ROE STATISTICS		
1	-0.4846	5.5638	3.9718	6.5638
2	-0.3336	162.5973	18.1943	163.5973
3	-0.4133	166.3103	21.0480	167.3103
4	0.2270	0.1640	-0.1207	1.1640

APPENDIX O

RANGES OF RATES OF RETURN BY PERIOD
1979 - 1985

PERIOD	ROA1	ROA2	ROA3	ROE
1979				
A-MIN	-0.0638	-0.0638	-0.0638	-1.1100
A-MAX	0.0487	0.0487	0.0487	1.1005
B-MIN	-0.1166	-0.1166	-0.1166	-1.3032
B-MAX	0.0570	0.0557	0.0557	1.1005
1980				
A-MIN	-0.0637	-0.0637	-0.0637	-0.8818
A-MAX	0.0515	0.0515	0.0515	0.4366
B-MIN	-0.1231	-0.1231	-0.1231	-2.6854
B-MAX	0.0499	0.0499	0.0499	0.7977
1981				
A-MIN	-0.0571	-0.0571	-0.0571	-0.9673
A-MAX	0.0567	0.0567	0.0567	5.0258
B-MIN	-0.1782	-0.1788	-0.1788	-2.0122
B-MAX	0.0863	0.0863	0.0863	1.0763
1982				
A-MIN	-0.0840	-0.0840	-0.0840	-2.7606
A-MAX	0.0623	0.0623	0.0623	0.7050
B-MIN	-0.1551	-0.1551	-0.1075	-6.3877
B-MAX	0.0496	0.0498	0.0498	1.4789
1983				
A-MIN	-0.1007	-0.1007	-0.1007	-3.1478
A-MAX	0.0743	0.0743	0.0743	0.9534
B-MIN	-0.2268	-0.2267	-0.2267	-2.3192
B-MAX	0.1012	0.1012	0.1012	1.7555
1984				
A-MIN	-0.1679	-0.1679	-0.1679	-1.7684
A-MAX	0.0537	0.0537	0.0537	1.2648
B-MIN	-0.1176	-0.1176	-0.1176	-4.3186
B-MAX	0.0516	0.0516	0.0516	1.7433
1985				
A-MIN	-0.2268	-0.2268	-0.2268	-9.9727
A-MAX	0.0682	0.0682	0.0682	0.7740
B-MIN	-0.3440	-0.3429	-0.3429	-3.9256
B-MAX	0.1767	0.1767	0.1767	3.2143

APPENDIX P

RAW DATASET FORMATION

Chapter 4, section 4.2, contains a discussion of the formation of SAS datasets from Federal Reserve tapes. The following describes the formation of variables and the exclusion of certain observations.

Savings banks and international banks were eliminated at all the dates studied because their relevant numerical field contain null values. These banks were identified by reference to report type.

DEPA (Total interest-bearing liabilities as of June) is a combination of several balance sheet line items:

1) Total deposits (including cashiers' checks) less cashiers' checks
2) Federal funds purchased
3) Demand notes
4) Mortgage indebtedness
5) Subordinated notes and debentures

Through December 1983, NOIA (June year-to-date income before securities transactions and extraordinary items) is a line item on the income statement. In 1984 the format of the income statement changed. The income statement format after 1983 is as follows:

Interest income	xx
Interest expense	(xx)
Net interest income	xx
Provision for loan loss	(xx)
Noninterest income (including gain or loss on assets held in Trading Account(SECTR))	xx

Gain (or loss) on securities not held in the trading accounts (SECNTR)	xx
Noninterest expense	(xx)
Income before tax and extraordinary items	xx
Tax	(xx)
Income before extraordinary items	xx
Extraordinary items (net of tax)	xx
Net income	xx

So that the 1984 and 1985 statistics might be comparable to those of the earlier years, NOI for the 1984 and 1985 periods is a combination of income statements line items. For banks with RPT1 equal to 54, SECTR contains null values. Therefore, for RPT1 = 51, 52, or 53:

NOIA = IBEIA - SECNTR - SECTR

For banks with RPT1 = 54:

NOIA = IBEIA - SECNTR

TIEA (June year-to-date interest expense) is also a combination of several income statement line items - interest on:

1) Certificates of deposit in excess of $100,000
2) Foreign deposits (if RPT1 = 51)
3) Other deposits
4) Federal funds purchased
5) Demand notes
6) Subordinated notes debentures

The remaining varibles are specific line items on the Federal Reserve tapes. Prior to the formation of each SAS dataset from Federal Reserve tapes, each tape (prior balance, midyear, or yearend) was subjected to a test run to verify the accuracy of the field locations of each variable used.

PDEP (prior interest-bearing liabilities) is calculated using the same combination of balance sheet line items as that combination for DEPA. Typically, December tapes are in Format 2 (containing two balance sheet files, one income statement file and other supplementary files). The two groups of balance sheet observations have been obtained from RCON and RCFD files (balance sheet) and placed in identification number order. Duplication of identification numbers existed in some instances. In such instances, only the parent bank observation contained a nonzero equity value (PTE), representing consolidated balance sheet data. Accordingly, all observations for which PTE=0 have been eliminated.

The first year actually analyzed was 1980. The combined dataset for 1980 was created containing 12-79, 6-80, and 12-80 raw data. Observations for which NAME=NAME1=NAME2=NAME4 was not a true statement were reviewed. Most of the exceptions were the result of differences in name abbreviations. During the review, however, it was noted that some numerical fields had zero values. Observations with the following variables equal to zero or missing were eliminated:

PTA	(not contained on 12-79 tape - prior)
TAA	(not contained on 6-80 tape - midyear)
TAB	(not contained on 12-80 tape - yearend)
TIEA	
PDEP	
DEPA	
PTE	(consolidated subsidiary)
TEA	" "
TEB	" "

Comparable eliminations were made for all years studied. The resulting raw datasets are as follows:

Year	Dataset	# of Observations
1979	DATA79.RD79	14029
1980	DATA802.RD80	14104
1981	DATA81.RD81	14211
1982	DATA82.RD82	14128
1983	DATA83.RD83	14042
1984	DATA84.RD84	13941
1985	DATA85.RD85	13900

APPENDIX Q

DISCUSSION OF KENDALL'S TAU CORRELATIONS

As is noted in Chapter 4, section 4.3, COFA ranking is negatively correlated with ranking by any of the four rate of return measures. The degree of negative correlation is not consistent from one year to the next, however. The negative correlations between ranking by cost of funds and ranking by rate of return are strongest in the years 1979, 1980, and 1981. The rank correlations between COFA and ROA1A, between COFA and ROA2A, and between COFA and ROA3A for these years are each less than negative 0.233. The rank correlations between COFA and ROEA for these years are less than negative 0.145 in each case.

In 1982 the rank correlations between COFA and each of the 3 return on asset measures are less than negative 0.131 in each case. The rank correlation between COFA and ROEA is approximately negative 0.076. While these correlations are negative, they are substantially less negative than those in 1979, 1980, and 1981. It appears that the negative relationship between cost of funds and rates of return is not as strong in 1982 as in the three prior years. In other words, banks with relatively higher rates of return in 1982 do not as consistently have relatively lower cost of funds.

Several explanations for this change in strength of correlation may be suggested. The 1980 Depository Institutions Deregulation and Monetary Control Act allowed commercial banks to issue transactions accounts (N.O.W. accounts) which paid on the order of 5% interest. These accounts were available beginning January 1, 1981. The 1980 Act also provided for establishment of the Depository Institutions Deregulation Committee, composed of heads of financial institution regulatory bodies and the Secretary of the Treasury. One of the responsibilities of the Committee was to phase out deposit interest rate ceilings by 1986. Throughout the 1980-1982 period, interest rate levels were at or close to historic highs. Factors such as these could have easily affected the relationship between rates of return and cost of funds. While interest rates were generally lower in 1982 than in the several preceding years, the more interest rate competitive deposit products offered by banks served to systematically shift the average cost of funds upward. At the same time market forces (including nonbank competition) precluded significant increases in loan rates. This inflexibility relative to preceding years served to weaken the negative correlation between cost of funds and rate of return (more profitable banks had high cost of funds) but not to eliminate it.

Referring to Table Q.1, it may be observed that the mean COFA increased from approximately 0.0222 in 1979 to 0.0293 in 1980 (32%) to 0.0371 in 1981 (26% increase from 1980 to 1981) to 0.0419 in 1982 (13% increase from 1981 to 1982). The pattern of change in mean rates of return (after deduction of interest and noninterest expense) is somewhat different. For example, mean ROA1A changed from approximately 0.0065 in 1979 to 0.0069 in 1980 (6% increase) to 0.0075 in 1981 (9% increase from 1980 to 1981) to 0.0067 in 1982 (11% decrease from 1981 to 1982). Similar comparisons may be made for ROA2A, ROA3A, and ROEA. In 1979, 1980, and 1981, both cost of funds and rates of return increased; i.e., increases in revenues more than offset increases in interest expense per dollar invested. In 1982 cost of funds again increased, but rates of return decreased; i.e., changes in revenue were insufficient to offset increases in interest expense per dollar invested. During this 1982 period of adjustment to increasing cost of funds, the rank correlations are weakened. Nonetheless, they remain negative.

In 1983 the rank correlations between COFA and the rates of return are negative, but not as strong as in 1982. The correlations between COFA and the asset rates of return range from negative 0.011 to negative 0.016. The correlation between COFA and ROEA is approximately negative 0.003. This year represents the weakest set of rank correlations for all years observed.

Several factors appear to be operating. In 1982 the Garn-St. Germain Depository Institutions Act allowed commercial banks to issue transactions accounts with deposit rates tied to money market rates in order to compete better with money market mutual funds. This factor alone would tend to increase the cost of funds. However, simultaneously, interest rate levels were continuing to moderate.

Again referring to Table 4.2, it may be observed that the mean COFA for 1983 was approximately 0.0345 (18% decrease from 1982 to 1983). This decrease in cost of funds was accompanied by decreases in mean rates of return. For example, mean ROA1A in 1983 was 0.0058 (13% decrease from 1982 to 1983). In 1983, interest expense per dollar invested decreased, but this decrease was not sufficient to offset an apparent decrease in revenue per dollar invested.

While 1983 rank correlatons are substantially weaker than those in preceding years, they are still negative. Even in this period, there is no evidence that high cost of funds is positively associated with high rates of return.

The 1984 rank correlations are stronger than 1983, all being less than negative 0.060 for COFA and all four rates of return. It should be noted that mean 1984 COFA is approximately 0.0365 (6% increase from 1983 to 1984). Mean rates of return, simultaneously, continue to decrease. For example, mean ROA1A for 1984 is 0.0050 (14% decrease from 1983 to 1984).

The 1985 rank correlations are not as strong as those in 1984, but, nevertheless, they are stronger than those observed in 1983. Correlatons between COFA and rates of return are all less than negative 0.034. Mean COFA for 1985 is 0.0348 (5% decrease from 1984 to 1985). This decrease in average cost of funds, however, is not sufficient to improve average rates of return. For example, mean ROA1A for 1985 is 0.0039 (21% decrease from 1984 to 1985).

Clearly cost of funds and rates of return are negatively correlated. The degree of correlation varies, as a function of market conditions and regulatory reforms but at no time is the correlation positive. This indicates that banks with low rates of return do not consistently have low targets or low costs of funds. It is reasonable to assert that banks with relatively low rates of return *are* in relatively more jeopardy of not reaching target returns.

Table Q.1

MEAN COST OF FUNDS AND RATES OF RETURN
1979 - 1985

	COFA	ROA1A	ROA2A	ROA3A	ROEA
1979	0.02217	0.00648	0.00642	0.00643	0.07757
1980	0.02934	0.00685	0.00685	0.00686	0.07873
1981	0.03708	0.00749	0.00737	0.00739	0.08244
1982	0.04193	0.00665	0.00652	0.00654	0.07231
1983	0.03454	0.00575	0.00591	0.00593	0.06665
1984	0.03651	0.00497	0.00493	0.00496	0.05611
1985	0.03484	0.00391	0.00432	0.00435	0.04692

APPENDIX R

DATA REVIEW

Original statistical analysis of 1983 yielded certain ROE values which were outside the range observed in the analysis of the other years. The source of these anomalies was identified and the analysis was repeated. The original statistics for 1983 with 14,042 observations are shown in Table R.1.

Comparing these results for 1983 to the final results for 1983 in Table 4.1 and Appendices Q (Table Q.1) and O, respectively, reveals little differences except for the range of ROE in Period B. The original ROEB range is from negative 2302% to positive 6036%. Prior to investigating these unusually large rates of return, all rankings, decile assignments, quartile assignments, and generation of related statistics (see Chapter 4, section 4.4) were performed. Further, all comparisons of Period A and Period B statistics were made. (See the last three paragraphs of Chapter 5, section 5.1 for a description of these comparisons.)

The two abnormally large ROEB statistics noted above were observed in decile 10 when the observations were ranked by all four rate of return measures. They represent the minimum and maximum values for Period B in decile 10. This minimum/maximum information, of course, is part of the

TABLE R.1

ORIGINAL STATISTICAL RESULTS
1983

CORRELATIONS

	COFA	ROA1A	ROA2A	ROA3A	ROEA
COFA	1.0000	-0.0159	-0.0105	-0.0116	-0.0031
ROA1A		1.0000	0.9355	0.9302	0.6949
ROA2A			1.0000	0.9936	0.7224
ROA3A				1.0000	0.7259
ROEA					1.0000

MEAN COST OF FUNDS AND RATES OF RETURN

COFA	ROA1A	ROA2A	ROA3A	ROEA
0.0345	0.0057	0.0058	0.0058	0.0653

RANGES OF RATES OF RETURN BY PERIOD

Period				
A-MIN	-0.1031	-0.1007	-0.1007	-4.9604
A-MAX	0.0743	0.0743	0.0743	0.9534
B-MIN	-0.2268	-0.2267	-0.2267	-23.0238
B-MAX	0.1012	0.1012	0.1012	60.3571

statistical output described in Chapter 4, section 4.4. However, the origin of such values was not apparent. To determine their origin, a listing of all observations in decile 10 (1404) was generated and reviewed. The observations were obtained from dataset SRAT831.SRA83 (1983 ratios sorted by ROA1A). It was noted that the minimum ROEB value of negative 2302% was the result of a net loss in Period B of $967,000 coupled with an average equity value in Period B of $42,000. While the resulting return on equity is unusual, there is nothing theoreticallty unsound about the statistic.

However, the maximum ROEB value of 6036% was the result of a net loss in Period B of $2,535,000 coupled with an average equity value in Period B of negative $42,000. This ROEB statistic was, therefore, misleading and uninformative. A negative average equity value can only be obtained if the beginning-of-year, mid-year, and/or end-of-year equity is negative. To identify all observations in this category, dataset DATA83.RD83 (1983 merged data as of 12-82, 6-83, and 12-83) was searched for observations with a negative equity value as of any relevant date. Fifteen (15) such observations were found, including the two which represented the mininmum and maximum ROEB statistics noted above.

These observations were eliminated and the resulting 14,027 were placed in a revised dataset RAT831.RA83 (1983 revised nonranked ratios). Using this revised dataset, all decile assignments, quartile assignments, generation of related statistics, and Period A/Period B comparisons were performed. As noted above, this is the basis of the 1983 data in Tables 4.1 and Q.1, Appendices E, L, and O.

Prior to the data manipulation for 1983, that for 1980, 1981, and 1982 was conducted. The underlying data for these years were then examined for any negative equity values.

In 1980, three observations in the final group of banks had negative equity values as of 12-79, 6-80, or 12-80. Only one bank had negative equity as of all three dates resulting in ATEA (average total equity Period A) of negative $294,500, and ATEB (average total equity Period B) of negative $378,000. Since this bank's NIA (net income Period A) was $2,000 and its NIB (net income Period B) was negative $163,000, its ROEA was 0.68% and its ROEB 43.12%. The ROEA value does not appear to be one which would materially distort the results for the year as the maximum ROEA (not involving a negative ATEA) was 43.67%. Similarly, the ROEB value of this observation does not appear to be one which would materially distort the results as the maxinum ROEB (not involving a negative ATEB) was 79.78%. The remaining two observations had negative equity as of 12-79, but positive equity as of 6-80 and 12-80, as well as positive ATEA and ATEB. Therefore, return on equity statistics for these two observations were not misleading; i.e., involved positive average equity values. No restatement of the 1980 statistics appears necessary.

In 1981, five (5) observations were noted with negative equity balances at one or more of the relevant dates (12-80, 6-81, 12-81). Of these, three (3) were associated with negative balances as of one of the three dates, but positive ATEA and positive ATEB. A fourth bank has negative equity values at all three relevant dates resulting in ATEA of negative $494,500 and ATEB of negative $583,500. This bank's NIA and NIB are $9,000 and negative $157,000, respectively. The corresponding equity returns are negative 1.82% for Period A and 26.91% for Period B. Since the minimum ROEA and maximum ROEB (not associated with negative equity balances) are negative 96.74`% and 107.64%, respectively, this bank's statistics would not appear to materially distort the results for the year, and no restatement is considered necessary.

The fifth bank in 1981 is associated with ATEA of negative $367,500, ATEB of $1,119,000, NIA of negative $1,847,000, and NIB of negative $697,000. The resulting ROEB is negative 62.29% and based upon a positive equity balance, and requires no adjustment. However, the ROEA statistic which results is 502.59%, and represents the maximum ROEA for Period A 1981. A recalculation of Kendall's tau correlations was not considered necessary. This conclusion was reached after reviewing the correlations for 1983 before and after elimination of fifteen (15) observations with negative equity values. The two sets of correlations are virtually identical. However, a manual recalculation (eliminating this observation) of the mean ROEA for the year, and of the mean and variance approximation for the appropriate deciles and appropriate quartiles was performed. The mean recalculatons are based on n observations; the variance approximation recalculations are based on n-1 observations. (It should be noted that using n observations for the variance approximation recalculations produces no significant difference.) A comparison of these adjustments to ROEA and the unadjusted statistics appears in Table R.2.

As described below, changes for each 1981 statistic within each decile or quartile have been included in Appendices C and J. Those changes incorporating the 1981 manually-adjusted ROEA data in Table R.2 are shown parenthetically in these Appendices. Ultimate conclusions from the data are not sensitive to these differences, however.

In 1982, five (5) observations were noted with negative equity balances as of one of the relevant dates (12-81, 6-82, or 12-82). None had negative balances at more than one date, and only one had a negative average equity balance. This bank's ATEB was negative $35,500 and its NIB was $82,000. The result is ROEB of negative 230.99%. As the minimum ROEB for 1982 (not involving a negative equity balance) is negative 638.78%, this observation would not appear to materially distort the statistical results for the year.

All statistical results for 1984, 1979, and 1985 exclude any observation with negative equity balances as of any of the relevant dates. For 1984 and 1979, such observations were eliminated at the time the unsorted ratio datasets

(RAT84 and RAT79) were created. This explains the difference in the number of observations in the merged raw dataset (DATA84 or DATA79) vis-a'-vis the unsorted ratio dataset. For 1985, such observations were eliminated at the time that the merged raw dataset was created. Thus, there is no difference in the number of observations in DATA85 and RAT85.

TABLE R.2

MANUAL ADJUSTMENTS INVOLVING ROEA
1981

UNRANKED DATA

ORIGINAL # OF OBSERVATIONS	MEAN ROEA BEFORE ADJUSTMENT	MEAN ROEA AFTER ADJUSTMENT
14,211	0.0824	0.0820

RANKED DATA
DECILES
(ORIGINAL NUMBER OF OBSERVATIONS = 1421)

RANKING VARIABLE	DEC	BEFORE ADJUSTMENT MEAN	VAR.	C.V.	AFTER ADJUSTMENT MEAN	VAR.	C.V.
ROA1A	10	-0.0059	0.0232	-2542.95	-0.0095	0.0054	-772.28
ROA2A	10	-0.0087	0.0231	-1740.93	-0.0122	0.0053	-594.67
ROA3A	10	-0.0089	0.0231	-1708.98	-0.0124	0.0053	-586.04
ROEA	1	0.1889	0.0185	72.06	0.1855	0.0020	24.50

QUARTILES
(ORIGINAL NUMBER OF OBSERVATIONS = 3553)

RANKING VARIABLE	QRT	BEFORE ADJUSTMENT MEAN	VAR.	C.V.	AFTER ADJUSTMENT MEAN	VAR.	C.V.
ROA1A	4	0.0260	0.0101	386.96	0.0246	0.0030	226.12
ROA2A	4	0.0247	0.0101	406.82	0.0233	0.0031	238.54
ROA3A	4	0.0245	0.0101	409.76	0.0231	0.0030	239.53
ROEA	1	0.1500	0.0084	61.35	0.1487	0.0017	28.43

APPENDIX S
ANALYSIS OF MEAN RETURN

TABLE S.1

DECILE ANALYSIS OF CHANGES IN MEAN RETURN
1979 - 1985

	RANKING		OBSERVED VARIABLE		
YEAR	VARIABLE	ROA1	ROA2	ROA3	ROE
1979	ROA1A	1	1	1	1
	ROA2A	1	1	1	2
	ROA3A	1	1	1	2
	ROEA	1	2	2	2
1980	ROA1A	1	1	1	1
	ROA2A	2	1	1	1
	ROA3A	1	1	1	1
	ROEA	1	1	1	1
1981	ROA1A	2	2	2	2
	ROA2A	2	2	2	2
	ROA3A	2	2	2	2
	ROEA	2	2	2	2
1982	ROA1A	2	2	2	2
	ROA2A	2	2	2	2
	ROA3A	2	2	2	2
	ROEA	2	2	2	2
1983	ROA1A	3	3	3	4
	ROA2A	3	3	3	4
	ROA3A	3	3	3	4
	ROEA	3	3	3	3
1984	ROA1A	3	3	3	4
	ROA2A	3	3	3	4
	ROA3A	3	3	3	4
	ROEA	5	5	5	6
1985	ROA1A	5	6	6	6
	ROA2A	6	5	5	6
	ROA3A	6	5	5	6
	ROEA	6	5	5	6

Note: All decile 1 percentage changes are negative. All decile 2 percentage changes are smaller negative values. This trend continues except as noted below.

Legend:

1 Period B mean › Period A mean beginning in either decile 6, 7, or 8.
2 Period B mean › Period A mean beginning in decile 9.
3 Period B mean › Period A mean only in decile 10.
4 Percentage change in mean return becomes more favorable from decile 1 to decile 10 except for decile 9 or deciles 8 and 9.
5 Percentage change in mean becomes more favorable from decile 1 to decile 10 except for deciles 4, 7, 8, and 9.
6 Percentage change in mean becomes more favorable from decile 1 to decile 10 except for deciles 6, 7, 8, and 9.

TABLE S.2

QUARTILE ANALYSIS OF CHANGES IN MEAN RETURN 1979-1985

YEAR	RANKING VARIABLE	OBSERVED VARIABLE ROA1	ROA2	ROA3	ROE
1979	ROA1A	1	1	1	1
	ROA2A	1	1	1	1
	ROA3A	1	1	1	1
	ROEA	1	1	1	1
1980	ROA1A	1	1	1	1
	ROA2A	1	1	1	1
	ROA3A	1	1	1	1
	ROEA	1	1	1	1
1981	ROA1A	2	2	2	2
	ROA2A	2	2	2	2
	ROA3A	2	2	2	2
	ROEA	2	3	2	2
1982	ROA1A	3	3	3	3
	ROA2A	2	2	2	2
	ROA3A	2	2	2	2
	ROEA	2	2	2	2
1983	ROA1A	4	4	4	4
	ROA2A	4	4	4	4
	ROA3A	4	4	4	4
	ROEA	3	3	3	4
1984	ROA1A	5	5	5	5
	ROA2A	5	5	5	5
	ROA3A	5	5	5	5
	ROEA	6	6	6	6
1985	ROA1A	6	6	6	6
	ROA2A	6	6	6	6
	ROA3A	6	6	6	6
	ROEA	6	6	6	6

Note: All quartile 1 percentage changes are negative and all quartile 2 percentage changes are smaller negative values.

Legend:

1 Percentage changes in quartiles 3 and 4 are positive and favorable, with the change in quartile 4 › change in quartile 3.

2 Percentage change in quartile 3 is negative (unfavorable) but is a substantially smaller negative change than that observable in quartile 2. Percentage change in quartile 4 is positive and favorable.

3 Percentage change in quartile 3 is negative (unfavorable) but is somewhat less negative than the percentage change observed in quartile 2. Percentage change in quartile 4 is negative and favorable (Period B mean exceeds negative Period A mean).

TABLE S.2 (cont'd):

4 Percentage change in quartile 3 is negative (unfavorable) but somewhat less negative than the percentage change observed in quartile 2. Percentage change in quartile 4 is positive and unfavorable (Negative Period A mean exceeds Period B mean).

5 Percentage change in quartile 3 is negative (unfavorable) and more negative than the percentage change observed in quartile 2. Percentage change in quartile 4 is negative and favorable (Period B mean exceeds negative Period A mean).

6 Percentage change in quartile 3 is negative (unfavorable) and more negative than the percentage change observed in quartile 2. Percentage change in quartile 4 is positive and unfavorable (Negative Period A mean exceeds Period B mean).

APPENDIX T
ANALYSIS OF VARIANCES

TABLE T.1

DECILE ANALYSIS OF CHANGES IN VARIANCE OF RATE OF RETURN
1979-1985

YEAR	RANKING VARIABLE	OBSERVED VARIABLE			
		ROA1	ROA2	ROA3	ROE
1979	ROA1A	1	1	1	1
	ROA2A	1	2	1	3
	ROA3A	1	2	2	3
	ROEA	3	3	3	2
1980	ROA1A	2	1	1	3
	ROA2A	2	1	2	3
	ROA3A	2	1	3	3
	ROEA	3	3	3	3
1981	ROA1A	2	3	3	3
	ROA2A	1	2	2	3
	ROA3A	1	2	2	3
	ROEA	3	3	3	3
1982	ROA1A	2	3	2	3
	ROA2A	1	3	3	3
	ROA3A	1	3	3	3
	ROEA	3	3	3	3
1983	ROA1A	3	3	3	3
	ROA2A	3	2	2	3
	ROA3A	3	3	2	3
	ROEA	3	3	3	2
1984	ROA1A	3	3	3	3
	ROA2A	3	3	2	3
	ROA3A	2	3	3	3
	ROEA	3	3	3	1
1985	ROA1A	3	2	1	3
	ROA2A	3	2	1	3
	ROA3A	3	2	2	3
	ROEA	3	3	3	1

Note: See the first paragraph of section 5.3.1 for an explanation of descriptive categories.

Summary by Observed Variable:

Category				
1	7	4	5	3
2	6	8	9	2
3	15	16	14	23

Summary by Ranking Variable:

	Category		
	1	2	3
ROA1A	7	5	16
ROA2A	6	9	13
ROA3A	4	9	15
ROEA	2	2	24

Table T.2

QUARTILE ANALYSIS OF CHANGES IN VARIANCE OF RATE OF RETURN 1979 - 1985

Year	Ranking Variable		Observed Variable		
		ROA1	ROA2	ROA3	ROE
1979	ROA1A	1	1	1	1
	ROA2A	1	1	1	1
	ROA3A	1	1	1	1
	ROEA	1	1	1	1
1980	ROA1A	1	2	2	1
	ROA2A	2	1	2	1
	ROA3A	2	1	1	1
	ROEA	1	1	1	1
1981	ROA1A	2	2	2	2
	ROA2A	2	2	2	2
	ROA3A	2	2	2	2
	ROEA	1	1	1	2
1982	ROA1A	1	2	2	1
	ROA2A	2	1	1	1
	ROA3A	2	1	1	1
	ROEA	1	1	1	1
1983	ROA1A	1	1	2	1
	ROA2A	1	1	2	1
	ROA3A	1	1	2	1
	ROEA	1	1	1	1
1984	ROA1A	1	1	1	1
	ROA2A	1	1	1	1
	ROA3A	1	1	1	1
	ROEA	1	1	1	1
1985	ROA1A	1	2	1	1
	ROA2A	1	1	1	1
	ROA3A	1	1	1	1
	ROEA	1	1	1	1

Note: See the first paragraph of section 5.3.2 for an explanation of descriptive categories.

Summary by Observed Variable:

Category				
1	21	22	19	24
2	7	6	9	4

Summary by Ranking Variable:

	Category	
	1	2
ROA1A	18	10
ROA2A	20	8
ROA3A	21	7
ROEA	27	1

APPENDIX U
ANALYSIS OF COEFFICIENT OF VARIATION

TABLE U.1

DECILE ANALYSIS OF CHANGES IN COEFFICIENT OF VARIATION 1979 - 1985

YEAR	RANKING VARIABLE	OBSERVED VARIABLE			
		ROA1	ROA2	ROA3	ROE
1979	ROA1A	3	3	1	1
	ROA2A	4	3	4	1
	ROA3A	4	4	3	4
	ROEA	4	4	4	3
1980	ROA1A	1	4	5	1
	ROA2A	5	4	4	1
	ROA3A	5	1	3	1
	ROEA	1	1	1	3
1981	ROA1A	1	4	4	4
	ROA2A	4	3	3	1
	ROA3A	4	3	3	1
	ROEA	2	2	1	4
1982	ROA1A	3	1	4	1
	ROA2A	3	3	3	1
	ROA3A	3	3	3	2
	ROEA	2	2	2	3
1983	ROA1A	2	2	2	2
	ROA2A	2	2	2	2
	ROA3A	2	2	2	2
	ROEA	2	2	2	3
1984	ROA1A	2	2	2	2
	ROA2A	2	2	2	2
	ROA3A	2	2	2	2
	ROEA	2	2	2	2
1985	ROA1A	2	2	2	2
	ROA2A	2	2	1	2
	ROA3A	2	2	2	2
	ROEA	2	2	2	2

Note: See the first paragraph of section 5.4.1 for explanation of descriptive categories.

Summary by Observed Variable:

Category				
1	3	3	4	9
2	14	14	12	12
3	4	6	6	4
4	5	5	5	3
5	2	-	1	-

Summary by Ranking Variable:

	Category				
	1	2	3	4	5
ROA1A	7	12	3	5	1
ROA2A	5	11	6	5	1
ROA3A	3	13	7	4	1
ROEA	4	16	4	4	-

Table U.2

QUARTILE ANALYSIS OF CHANGES IN COEFFICIENT OF VARIATION 1979 - 1985

Year	Ranking Variable	Observed Variable			
		ROA1	ROA2	ROA3	ROE
1979	ROA1A	1	1	1	3
	ROA2A	1	1	1	2
	ROA3A	1	1	1	2
	ROEA	2	2	2	1
1980	ROA1A	2	2	2	3
	ROA2A	2	2	2	3
	ROA3A	2	2	2	3
	ROEA	2	2	2	1
1981	ROA1A	2	2	2	3
	ROA2A	2	2	2	3
	ROA3A	2	2	2	3
	ROEA	3	3	3	2
1982	ROA1A	2	2	2	3
	ROA2A	2	2	2	2
	ROA3A	2	2	2	2
	ROEA	3	3	3	2
1983	ROA1A	2a	1	2a	1
	ROA2A	2a	2a	2a	2a
	ROA3A	2a	2a	2a	2a
	ROEA	2a	2a	2a	1
1984	ROA1A	1	1	1	1
	ROA2A	1	1	1	1
	ROA3A	1	1	1	1
	ROEA	1	1	1	1
1985	ROA1A	1	1	1	1
	ROA2A	1	1	1	1
	ROA3A	1	1	1	1
	ROEA	1	1	1	1

Note: See the first paragraph of section 5.4.2 for explanation of descriptive categories.

Summary by Observed Variable:

Category	ROA1	ROA2	ROA3	ROE
1	11	12	11	12
2	11	11	11	6
2a	4	3	4	2
3	2	2	2	8

Summary by Ranking Variable:

	Category			
	1	2	2a	3
ROA1A	13	11	-	4
ROA2A	11	11	4	2
ROA3A	11	11	4	2
ROEA	11	8	3	6

APPENDIX V
INFERENCES OVER TIME

TABLE V.1

INFERENCES OVER TIME
ROA1 STATISTIC
DECILE ANALYSIS

RANKING VARIABLE

	ROA1A		ROA2A		ROA3A		ROEA	
	F<=	F>=	F<=	F>=	F<=	F>=	F<=	F>=
	132.6	138.9	36.9	38.4	30.0	30.6	3.9	4.1
DECILE								
1	7	-	7	-	7	-	7	-
2	6	1	5	2	5	2	4	3
3	4	3	3	4	3	4	4	3
4	2	5	3	4	2	5	4	3
5	2	5	2	5	3	4	4	3
6	1	6	3	4	3	4	3	4
7	-	7	2	5	1	6	2	5
8	2	5	2	5	3	4	-	7
9	4	3	1	6	1	6	-	7
10	7	-	7	-	7	-	7	-
χ^2	32.285*		23.142**		24.285*		30.000*	
YEAR								
1979	5	5	2	8	4	6	7	3
1980	7	3	9	1	8	2	7	3
1981	8	2	7	3	6	4	9	1
1982	5	5	3	7	2	8	4	6
1983	4	6	5	5	5	5	4	6
1984	3	7	2	8	3	7	2	8
1985	3	7	7	3	7	3	2	8
χ^2	8.800		18.400**		11.200		17.600**	

* Significant at 0.5% level
** Significant at 1.0% level

TABLE V.2

INFERENCES OVER TIME
ROA2 STATISTIC
DECILE ANALYSIS

	RANKING VARIABLE							
	ROA1A		ROA2A		ROA3A		ROEA	
	F<=	F>=	F<=	F>=	F<=	F>=	F<=	F>=
	28.1	30.1	153.8	154.7	107.6	109.4	4.3	4.3
DECILE								
1	7	-	7	-	7	-	7	-
2	6	1	7	-	7	-	5	2
3	2	5	4	3	5	2	4	3
4	1	6	1	6	2	5	4	3
5	3	4	2	5	2	5	4	3
6	2	5	1	6	2	5	3	4
7	3	4	-	7	-	7	1	6
8	2	5	2	5	2	5	-	7
9	2	5	4	3	1	6	-	7
10	7	-	7	-	7	-	7	-
X^2	26.571*		38.000*		20.000***		33.428*	
YEAR								
1979	3	7	6	4	8	2	7	3
1980	8	2	7	3	7	3	7	3
1981	7	3	8	2	6	4	8	2
1982	5	5	4	6	3	7	4	6
1983	5	5	4	6	4	6	5	5
1984	3	7	3	7	4	6	2	8
1985	4	6	3	7	3	7	2	8
X^2	8.800		9.600		9.600		14.800	

* Significant at 0.5% level.
*** Significant at 2.5% level.

TABLE V.3

INFERENCES OVER TIME
ROA3 STATISTIC
DECILE ANALYSIS

RANKING VARIABLE

	ROA1A		ROA2A		ROA3A		ROEA	
	F<= 24.2	F>= 24.7	F<= 87.0	F>= 88.4	F<= 131.0	F>= 131.8	F<= 4.3	F>= 4.4
DECILE								
1	7	-	7	-	7	-	7	-
2	5	2	6	1	6	1	5	2
3	1	6	3	4	3	4	4	3
4	2	5	1	6	2	5	4	3
5	3	4	2	5	2	5	4	3
6	3	4	3	4	1	6	3	4
7	3	4	2	5	1	6	1	6
8	2	5	-	7	2	5	-	7
9	2	5	4	3	4	3	-	7
10	7	-	7	-	7	-	7	-
χ^2	23.142**		31.142*		28.857*		33.428*	
YEAR								
1979	4	6	7	3	6	4	7	3
1980	8	2	6	4	10	-	7	3
1981	7	3	7	3	7	3	8	2
1982	5	5	3	7	4	6	4	6
1983	4	6	5	5	3	7	5	5
1984	3	7	4	6	3	7	2	8
1985	4	6	3	7	2	8	2	8
χ^2	8.000		7.200		19.200*		14.400****	

* Significant at 0.5% level
** Significant at 1.0% level
**** Significant at 5.0% level

TABLE V.4

INFERENCES OVER TIME
ROE STATISTIC
DECILE ANALYSIS

RANKING VARIABLE

	ROA1A		ROA2A		ROA3A		ROEA	
	F<=	F>=	F<=	F>=	F<=	F>=	F<=	F>=
	7.3	7.4	8.1	9.6	8.6	9.0	201.1	207.8
DECILE								
1	7	-	7	-	7	-	7	-
2	6	1	6	1	6	1	5	2
3	4	3	4	3	4	3	3	4
4	3	4	4	3	4	3	1	6
5	2	5	2	5	2	5	3	4
6	3	4	3	4	3	4	3	4
7	1	6	-	7	-	7	1	6
8	2	5	2	5	2	5	3	4
9	-	7	-	7	-	7	2	5
10	7	-	7	-	7	-	7	-
χ^2	31.142*		34.571*		34.571*		24.285*	
YEAR								
1979	7	3	8	2	8	2	8	2
1980	8	2	8	2	8	2	8	2
1981	6	4	6	4	6	4	8	2
1982	5	5	4	6	4	6	4	6
1983	4	6	4	6	4	6	2	8
1984	3	7	3	7	3	7	3	7
1985	2	8	2	8	2	8	2	8
χ^2	11.200		13.600****		13.600****		20.000*	

* Significant at 0.5% level
**** Significant at 5.0% level

Table V.5

INFERENCES OVER TIME
QUARTILE ANALYSIS

	PATTERN							
	A		B		C		D	
	F<= Med. F	F>= Med. F	F<= Med. F	F>= Med. F	F<= Med. F	F>= Med. F	F<= Med. F	F>= Med. F
QUARTILE								
1	7	-	7	-	7	-	7	-
2	-	7	1	6	2	5	1	6
3	-	7	-	7	-	7	-	7
4	7	-	6	1	5	2	6	1
X^2	28.000*		21.142*		16.571*		21.142*	
YEAR								
1979	2	2	3	1	3	1	2	2
1980	2	2	2	2	3	1	3	1
1981	2	2	2	2	1	3	1	3
1982	2	2	2	2	1	3	2	2
1983	2	2	2	2	2	2	2	2
1984	2	2	2	2	2	2	2	2
1985	2	2	2	2	2	2	2	2
X^2	0.000		1.000		4.000		2.000	

* Significant at 0.5% level

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The author attended the University of Kentucky and the University of Houston at Clear Lake City, earning the Bachelor of Science in Accounting and the Master of Business Administration degrees, respectively. In addition, she has worked as a certified public accountant, an internal auditor, and a financial analyst. Currently, she is an assistant professor of finance.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Arnold Heggestad

Arnold Heggestad
Professor of Finance, Insurance,
and Real Estate

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Roy Crum

Roy Crum
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and Real Estate

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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